FLIGHT

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A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

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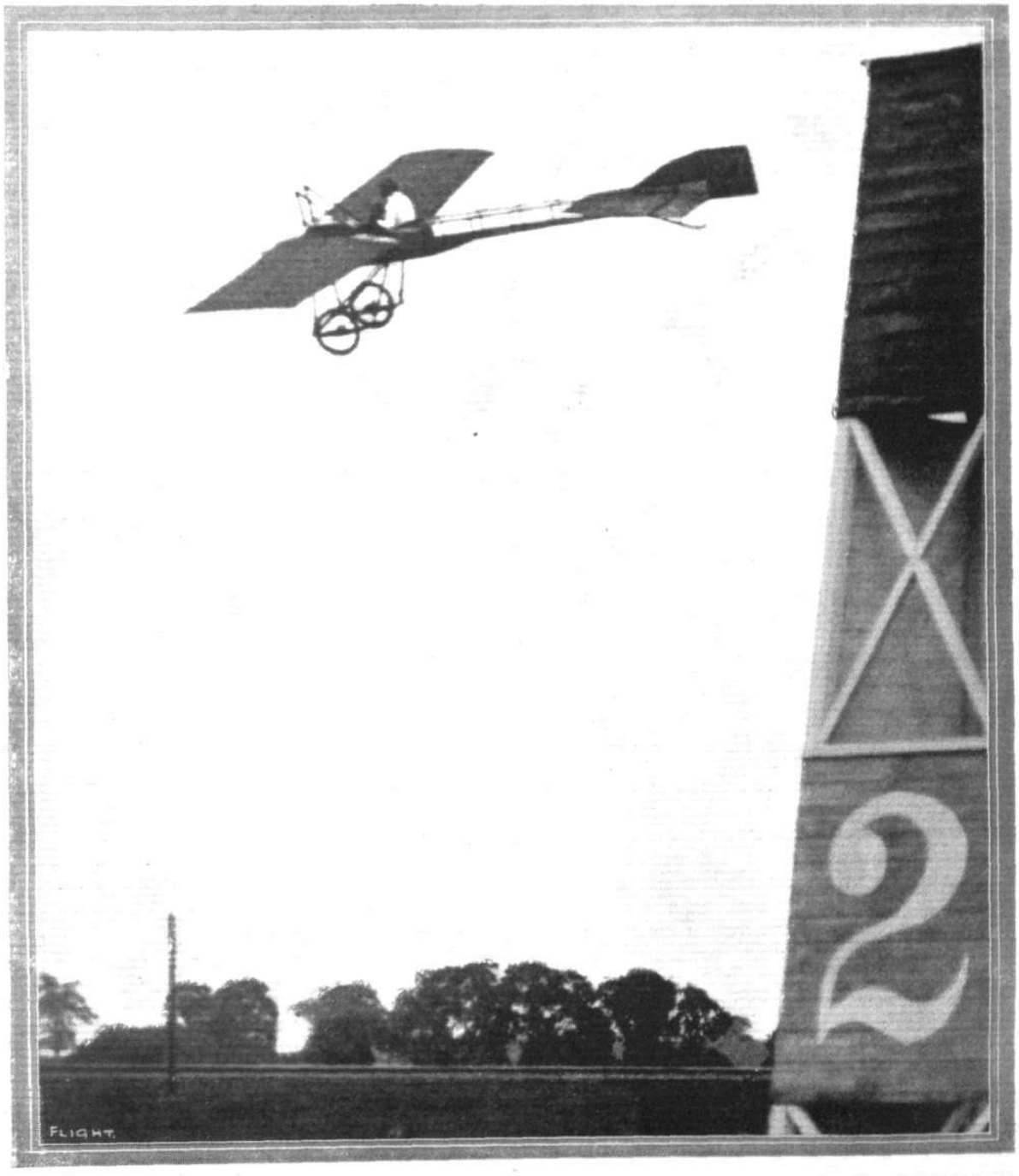

A fine bank by Valentine on the Deperdussin round No. 2 pylon at Hendon in the cross-country handicap.

EDITORIAL COMMENT.

The Toll of the Air.

As might be expected it is an onerous price that is being paid for the conquest of the air. Nevertheless up to the present our British airmen have been singularly fortunate, for until the sad happenings of the past few days the total death-roll among pilots was fifteen, exclusive of two passengers who have lost their lives, as compared with some two hundred who have sacrificed themselves on the altar of what they deemed their duty in other countries than our own. Even including the four officers of the Royal Flying Corps who have within the past week given their lives in the service of the country, the British death-roll amounts to under twenty which, without the very slightest wish to appear in the least degree callous is not an extravagant price to pay for aerial supremacy. We say this with the profoundest sympathy for those who have gone from among us and for the sorrowing relatives whom they have left to mourn their loss, but in the midst of our grief for the loss of some who were personal friends, we must not forget that it is inevitable that the price of conquest must be paid. And it is in the full knowledge of this, that the magnificent *personnel* of the Royal Flying Corps goes about its business—with this knowledge in the fullest view, indeed, that the officers who compose this *corps d'élite* volunteer to serve in it and we have at least this comfort in our sorrow for the lost lives, that the men who have sacrificed them have died as they would, as soldiers, have desired—in serving their King and country.

We fully anticipate that the two accidents which have marred the opening days of the army manœuvres will lead to something of an outcry from the "humanitarians," and that there will be a call to have done with flying altogether. That always happens in these cases. It was so when the first crude submarine vessels were first introduced into the navies of the world and drowned their crews with depressing frequency. There is a marked analogy between the aeroplane and the submarine in the scheme of national defence. Both, to the average layman, are uncanny craft and both have had to develop through a process of trial and error. Each has had its own element to conquer and the conquest has entailed the laying down of precious lives. In the one case we have done with the sacrifice in the cause of development, because the craft has passed through the dangerous stage of its evolution and is now, save for the accidents of the sea, practically as safe as any other type of sea-going vessel. In the other case—that of the aeroplane—the position is different. It would be idle to argue that the aircraft of to-day is an absolutely safe vehicle of locomotion, but it is not, on the other hand, as dangerous as the uninstructed man in the street believes it to be when he reads of the fatalities which, it must be admitted, recur with distressing frequency. It is going through the same process of evolution as the submarine of a couple of decades ago and—the fact must be faced—its development is taking the same toll of human life and, we fear, must do so until it arrives at the state of relative perfection that has been reached by the under-water craft. One thing is certain, that we cannot arrest the wheels of progress. For good or ill—we ourselves believe for good—the era of aircraft is with us now and no matter at what cost of human life its necessities must be met and grappled with in a spirit of calm and considered courage. No considerations of panic must be allowed to weigh in the formulation of our national policy in its relation to aerial navigation. Not that we think there is any danger of their being allowed to do so as far as the authorities are concerned and it is not they to whom we appeal to regard the whole question from the standpoint of the wider interests, but to the great mass of public opinion which in these matters is too apt to be swayed by false issues.

That the *personnel* of the Army is to be relied on is assured, and Major Burke's simple remark, "We fly when it is our duty to fly," may be taken as typical of the spirit there existing.

That the right feeling prevails with the public we have never a doubt, this being strongly reflected in the riders—messages which should go down to posterity—of both the juries which have had the sad task of enquiring into the two recent calamities.

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"Britain's Handicap."

With the above as a subsidiary title, there appeared in the *Daily Mail* of last Tuesday an exceedingly well-written and excellently balanced article from the pen of Mr. Claude Grahame-White which should help considerably to bring about that understanding in the public mind of the problems and necessities of aerial defence for which we have endeavoured to plead in the article which precedes this. He takes as his text the fact that France is spending a round million sterling this year on military aeroplanes and that according to her programme she will, at the end of 1914, possess no less than 1,000 effective warplanes. He makes several very valuable points, but of them all the principal one is that above all things it is essential that we should, if we desire to keep abreast of our rivals—and that we *must* do so admits of no argument—spend much more money than we do on the training of pilots. As in our view it would be impossible to put the case better than Mr. Grahame-White himself puts it, it is worth while quoting him in his own words.

"We can buy warplanes," he says, "without difficulty, to make up our deficiency; but what we cannot buy are the expert airmen, without whom our fleet of machines would be useless.

"Of adequately trained pilots and observers we still possess only an insignificant handful. Even with the naval and military schools now in existence we shall not have produced, by the end of the year, more than about sixty skilled men. These will make a lamentably poor showing against the several hundred absolutely dependable pilots and observers whom France will possess - to say nothing of the elaborate aerial organisation which she and Germany have now built up, and of which we have scarcely a beginning.

"The problem, really, is not difficult. More money must be spent upon the training of the men who are to handle our warplanes. Grudgingly, and only when literally forced to do so, has our Treasury voted sums for aviation. The matter now rests in the hands of the ordinary, non-fighting citizen. He has only to insist, not individually, but in his millions, and the purse-strings will be opened."

Beyond all doubt this is the absolute *crux* of the position as it stands to-day. The military authorities themselves are, we feel certain, fully alive to all the necessities of the case, and they are doing all they can with the funds at their disposal. But unless the pressure of public opinion is brought to bear upon the Treasury the hands of the War Office and the Admiralty will be tied for want of money. We have had some earnest during the past ten days of the possible wastage of trained pilots that serious war would entail and that of itself has shown us how absolutely right Mr. Grahame-White is in his appeal for more trained pilots to build up a reserve equal to every contingency.

FLIGHT

HENDON SEPTEMBER MEETING.

EARLY Saturday afternoon the wind was rather too rough for competition flying, and as it was not till after 6.30 p.m. that the first event—the Cross-Country Handicap—could be started, there was only time for the first heat of the Grand Speed Handicap to be flown. Some very good exhibition flying was seen, however, including the trial flight of a new monoplane.

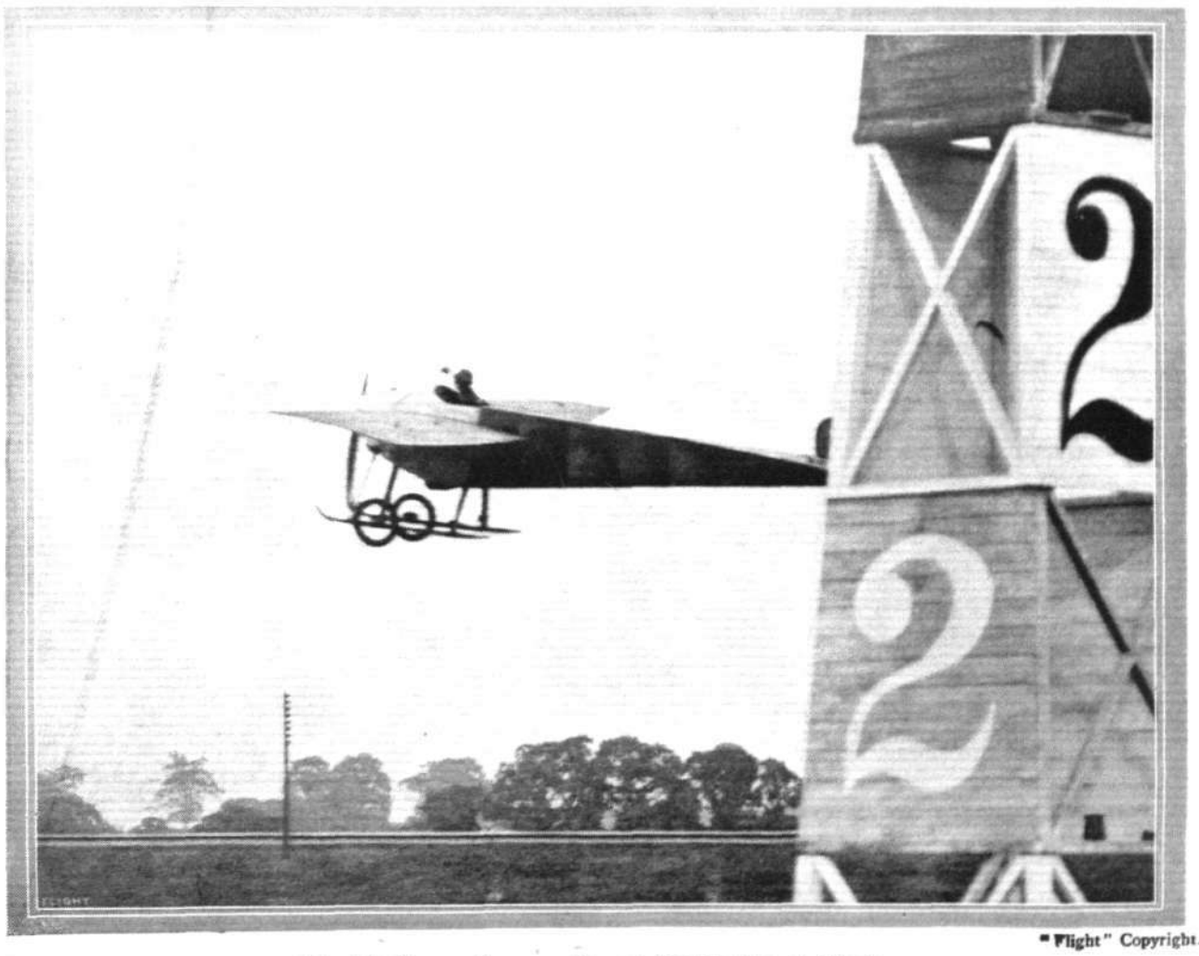
At about 3.30 p.m., Sabelli arrived from Brooklands on the Hanriot monoplane, having had to do battle with a wind in the neighbourhood of about 40 m.p.h.—a feat for which he received from the directors of the London Aerodrome a silver shield trophy. Just on 4 o'clock, Marcel Desoutter made a trial flight on the 50-h.p. Gnome-Blériot and experienced a healthy young side-slip near the sixpenny enclosure. Louis Noel was the next up on the 80-h.p. Gnome-Henry Farman biplane, which showed a considerable speed with the wind. Desoutter then put in another flight on the Blériot, followed by Jules Nardini on the two-seater Anzani-Deperdussin monoplane, which had the appearance of a gigantic rocket, as the engine was receiving an over generous supply of oil. The next up was Sabelli on the Hanriot, who executed some really fine banked right and left-hand turns.

After these preliminary flights, the Cross-Country Handicap to Elstree and back twice was started, the competitors being Sabelli on the Hanriot (scratch), Desoutter on the Blériot (1 min. 45 secs. start) and L. Noel on the Farman (3 mins. 22 secs. start). Noel was well ahead at the end of the first circuit, Desoutter and Sabelli coming in together, the latter apparently losing a little in rounding the pylon on starting the second journey. The first to cross the line was Noel (time 21 mins. 14 secs.), Sabelli was second in 23 mins. 22 secs. (handicap time), Desoutter's time being 24 mins. 45 secs.

While the cross-country race was in progress, Nardini went up in the Anzani-Dep., which seemed to be flying much better, some adjustments having been made. After the race was over Richard T. Gates took charge of the Henry Farman and gave one of his high flights, and Nardini went up again, this time as a passenger. When they came down the Sonoda biplane, the Green engine of which had been tuned up during the afternoon by Mr. Fred May, made its appearance and, piloted by G. W. Meredith, made one or two straight flights. At about 6.30 the first heat of the Grand Speed Handicap over four laps of the aerodrome was held, with Marcel Desoutter on the Blériot (scratch) and Nardini, with Capt. C. Tyrer as passenger, on the Dep. (1 min. 10 secs. start) as starters. On the second lap Nardini came down owing to engine trouble, so Desoutter was left to finish on his own.

As it was now about 7.30 p.m. it was too late to continue the speed contest, so it was announced that it would be postponed until the next meeting. Mrs. Stocks, however, gave a seven minute flight on the Anzani-Blériot, her "get-off" being rather sensational. On starting, the monoplane made a sharp swerve and it looked as if there was going to be a smash, but a very smart piece of manœuvering on the part of that plucky aviatress put matters right and she continued merrily on her way. The Sonoda was also making further straight flights, while the event of the day was the appearance of the new Grahame-White monoplane, designed by Mr. Ding. Although on more or less conventional lines this little monoplane, possesses several original and interesting features. The principal of these is the fitting of a stream-lined silencer with a 35-h.p. "Y" Anzani engine. The overall length of this monoplane is about 24 ft. and the span is 31 ft. Marcel Desoutter occupied the pilot's seat, and after a preliminary run of the engine gave the signal to let go. In a few hundred yards the monoplane was seen to rise off the ground and thus continue until the end of the aerodrome was reached, when Desoutter switched off—flash! bang!! It was only a backfire in the silencer, but De-outter did not know this, so promptly came down; he turned the machine round and flew back towards the sheds, finishing with another Brock's Benefit display.

On Sunday there was a stiff wind of about 35 m.p.h. but in spite of this, some plucky flights were made; Desoutter, for instance, in one of his flights being in the air for 30 mins. Flights were also made by Noel on the Farman with a passenger. Sabelli intended to fly to Brooklands, but returned soon after he had started owing to engine trouble and weather conditions.



Mr. Sabelli rounding a pylon on the Hanriot at Hendon.

AERO EDUCATIONAL PREMIUMS.

By GRIFFITH BREWER.

No science has in its infancy ever been in greater need of inventive ingenuity than the science of aeronautics. Consequently every scheme which may attract inventive talent and encourage men to study the laws and phenomena relating to the atmosphere should be welcomed for the furtherance of the art of flight.

The inventor, just the same as other men, must profit by his work, or he will turn his attention to other things in order to keep his home together, and this necessity of enabling the inventor to reap his just reward has long been recognised by the State, for it grants patents which enable the inventor and those who pay him royalty to exercise the invention exclusively for fourteen years, and so recoup himself for his work and outlay.

Patent specifications, like other legal documents, require to be drawn by skilled hands, and consequently 271 patent agents exist on a roll known as the Patent Agents Register, and it is to one of these that the inventor of a flying machine goes with his invention when he first conceives it, and has it in a nebulous state. Obviously, it is in the interests of the inventor of the aerial invention, to discuss the specification with a patent agent who has some knowledge of aeronautics, but unfortunately there has been too little inducement in this small profession for its members to acquire more than a smattering of the subject, with the result that patentees of aeronautical inventions have not been able to command the amount of technical help which they can so readily obtain in the older branches of the manufacturing arts.

The object of this scheme is to place some inducement in the way of patent agents to take up the subject of aeronautics more seriously, and thus qualify themselves to be of greater service to their clients in this new industry. In recruiting several patent agents to specialise in aeronautics, a considerable service will be done for those engaged on aeronautical experiments and inventions, because they will be given better opportunities of securing good protection, and thus in finding their inventions more profitable than they otherwise might, they will be encouraged to persevere and produce still further advances in the cause of aerial science.

Were I Chancellor of the Exchequer, with a desire to strengthen my country against foreign invasion, I should consider it my duty to encourage every Englishman to acquire some knowledge of aeronautics, but unfortunately, those in office regard other calls as more important.

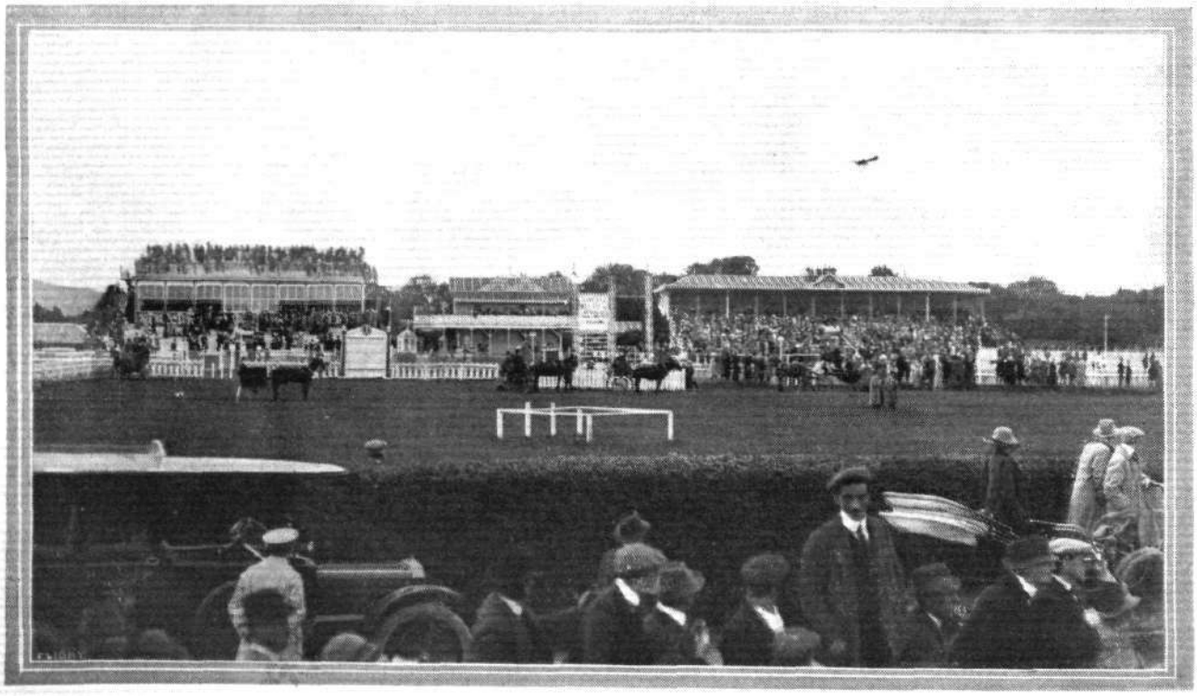
There are two kinds of tests open at the present time, viz., that involving skill and dexterity, and that involving general aeronautical knowledge.

The first of these is recognised by the Royal Aero Club by the issue of aviation and aeronauts' certificates, whilst the general aeronautical knowledge is recognised and judged by the Aeronautical Society, which admits members who possess the necessary knowledge to become Fellows and Associate Fellows. In order to apply a standard, I should, had I the means at my disposal, reward all those who obtained the Royal Aero Club certificates, or who were admitted to the technical side of the Aeronautical Society, but it is necessary to move more modestly. The Royal Aero Club certificates have the Royal Flying Corps and other sporting inducements to make them attractive, but acquirement of general aeronautical knowledge has hitherto gone unrewarded. It is, therefore, proposed to offer premiums to those who acquire aeronautical knowledge and who prove their attainments by passing the tests imposed on applicants for Associate Fellowship and Fellowship of the Aeronautical Society. But even to offer premiums to all who secure the qualifications of Associate Fellow and Fellow of the Society would require a long and lasting purse, so the first attempt must be confined to a small profession, and let us hope one which will carry the benefit of acquired knowledge outside its own ranks. It is for these reasons that the first experiment in this direction is to be confined to the little band of patent agents, and if the members of that profession respond to this appeal for them to add aeronautics to the subjects which they take seriously, then perhaps some larger sum might be brought forward to give similar inducements to the members of some larger professions, such for instance as to officers of the Army, or officers of the Navy, who could thus be encouraged to acquire the necessary aeronautical knowledge and enter the technical side of the Society.

The premiums will consist of £25 to every patent agent becoming an Associate Fellow of the Aeronautical Society, and a further £50 on becoming a Fellow, and these qualifications are open to all patent agents who, being members of the Society, show themselves to be possessed of the necessary aeronautical knowledge. Donors to the fund, however, cannot receive premiums. The fund from which these sums are available for a period of five years, has been opened with a sum of £200, contributed equally by Mr. John Dunville and myself.

Every facility will be given to patent agents wishing to become members, and they may obtain the necessary nomination through any present member. The following patent agents are already members of the Society, and they would no doubt be glad to propose names of their fellow patent agents on application :—

Atkinson Adam, W. H. Ballantyne, George Barker, Griffith Brewer, Dugald Clerk, T. W. Rogers, W. P. Thompson.



THE DUBLIN-BELFAST AEROPLANE CONTEST.—Mr. J. Valentine flying over the grand stand, Leopardstown racecourse, Dublin, on his 50-h.p. Deperdussin.

FLIGHT

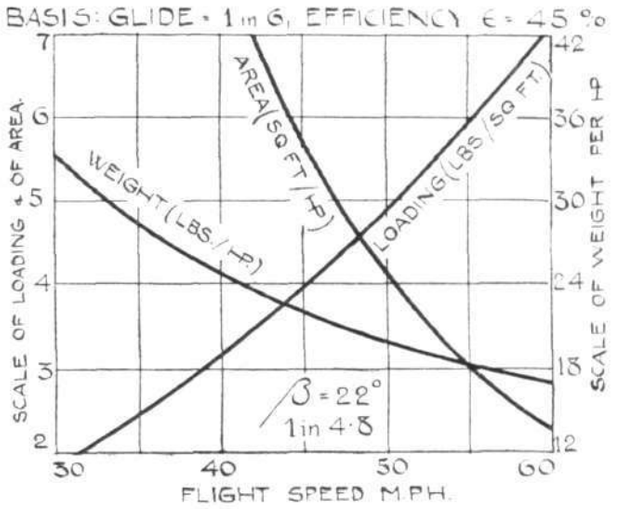
FURTHER DEVELOPMENTS IN X.

By A. E. BERRIMAN, Technical Editor.

WHAT it is that I am "driving" at precisely, in connection with my constant X and its sub-divisional products, x and ϵ, still remains, apparently, something of a mystery to many readers of FLIGHT. Let me, therefore, try and explain their meaning in open language, without the protection of those mathematical ramparts which serve, it seems, to divert so easily the onrush of interest that might otherwise carry all readers to the very heart of the problem.

An aeroplane, it has always seemed to me, must, fundamentally, be very much as any other vehicle when it comes to a question of discussing the relationship of power, weight and speed. Power is an expression of the product of weight and speed, and it follows that if, on any vehicle, the weight and the power are fixed quantities, then there is one speed in particular that satisfies the equation and is, so to speak, especially appropriate to the design.

Because the vehicle is an aeroplane, surely it should not alter the basic laws of mechanics. There may be as much mystery as you please about the virtues of this or that wing shape, but it is a mystery incidental to the broader problem, and has no right to veil the clear perception of the outstanding mechanical conditions that must be met by the design before the aeroplane can be regarded as a fairly proportioned vehicle of mechanical locomotion. This simple conception of the situation has been the foundation on which I have endeavoured, during the past years, to establish a connected line of thought throughout my occasional theoretical articles, and which have, in a condensed form, since been published in the little book, "Principles of Flight." It is a basis that has always appealed to me with particular force, partly because it is such a universal field of interest and serves, therefore, the more readily to attract trained minds to the study of aeronautics, which is, of course, incidental to the



purpose of publishing a journal like FLIGHT, and partly because it seemed such a useful antidote to the confusion that frequently results from the too prolonged discussion of the purely aerodynamic aspects of aviation. Not that the simple mechanics of the aeroplane is always as "simple" as it looks at first, but its complication, I have always felt, must ultimately resolve itself into comparative simplicity under the disintegrating influence of continuous study and I hope that a new stage in the process may have been reached through the constant X.

Reverting to the initial argument, it has been explained that the precise speed of any vehicle is merely the automatic consequence of applying a certain power to the propulsion of a given weight. Consequently, in an aeroplane, where the power and the weight are both fixed (at the moment, we are only concerned with ascertaining the most that is available from the use of the full power of the engine) it follows that there is a particular speed of flight that is appropriate to the utilization of the full power of the engine and *to which the design of the wings should, accordingly, be suited.*

An aeroplane differs from a motor car or other land vehicle in that its weight is supported on wings, which carry this load by virtue of their own speed through the air. Unless, therefore, the speed of the machine, as a whole, suits the requirements of the wings that form part of it, they will not lift properly; and, conversely, unless the speed for which the wings are designed is adjusted to the requirements of the weight of the machine as a whole, there will be a corresponding disproportion in the utilization of the full power of the engine and of the actual flight speed of the machine that results therefrom.

When, however, these different aspects of one and the same case have been nicely co-related to one another, then the machine as a whole flies easily at its proper speed, utilises its engine power to the full, and has the adequate ability to climb and accelerate that are incidental to the fulfilment of these basic principles of design, and are, besides, fully adequate, it appears, to meet the requirements of safety and utility.

Thus, it is indeed a matter of distinct practical utility readily to be able to decide on the exact relative values of power, weight, speed and wing area that can be designed into one harmonious whole, and this it is the purpose of the X constant to assist.

Firstly, let us take any given machine weighing, say, 2,500 lbs., and fitted with an engine that is known to develop 100-h.p., and provided with wings of 500 sq. ft. area. These dimensions, once the machine is built, are fixed and unalterable whether the machine is in flight or taxying on the ground.

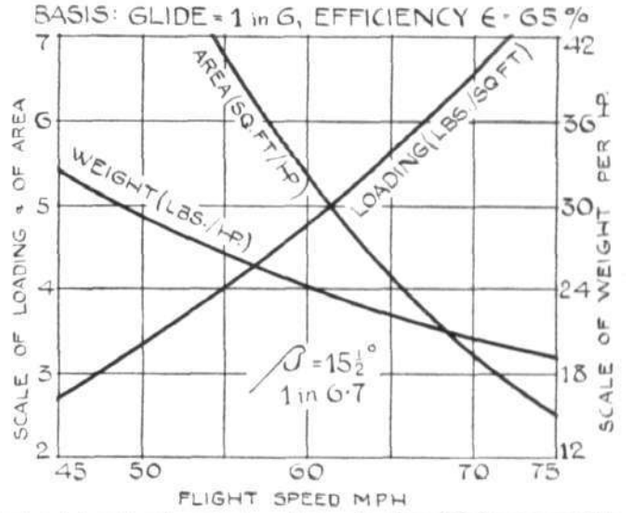
Now, according to my reckoning, the speed proper to the above design is 62½ m.p.h., and the way this is calculated is as follows:—

$$\text{(Weight + power)} \times \text{(weight + area)} = X$$
$$= (2{,}500 \text{ lbs.} + 100 \text{ h.p.}) \times (2{,}500 \text{ lbs.} + 500 \text{ sq. ft.}) = X$$
$$= 25 \text{ lbs./h.p} \times 5 \text{ lbs./sq. ft.} = 125.$$

And $X + 2 = x$ = proper speed in miles per hour.*

$= 125 + 2 = 62{\cdot}5$ m.p.h.

That, surely, is simple enough for anyone to follow. Let me therefore take the calculation another step further. Thus, if 62·5 m.p.h. is the proper speed, then the power actually being utilised is, by the first principles of mechanics, as already described, an expression of 62·5 times the weight. In this connection it is not proper to take the whole weight, because the resistance to



horizontal motion is never more than a fraction of it for any vehicle. In an aeroplane the resistance is about one-sixth of the weight; consequently, we may say that when the above machine is flying at 62·5 m.p.h., we can account for $[62{\cdot}5 \times (2500 + 6)] + 375$ H.P. $= 70$ H.P. (the constant 375 reduces mile-pounds-per-hour to horse-power). In other words, it would be demonstrating an overall efficiency of

* X has the dimensions of velocity. Thus:—
Let W_1 = load/h.p.; W_2 = loading/sq. ft.
Then $X = W_1 W_2 = (m/mlt^{-1})(fV^2) = (fV^{-1})(fV^2) = fV$. $\therefore X = kV$.
Now, let ϵ = efficiency of power transmission, including propeller; G = equivalent effective grade for horizontal flight at maximum flight speed V (G is expressed as 1 in G).

Then, $V = \frac{375\epsilon G}{W_1} = (X + k)$.

$\therefore k = \frac{XW_1}{375\epsilon G}$.

From inspection of data established by the Military Trials, the various symbols in the above expression may plausibly be substituted by figures in the order of the following numerical values: thus, in the case of a typical fast monoplane, $X = 150$, $W_1 = 25$, $\epsilon = 80$ per cent.; $G = 6$.

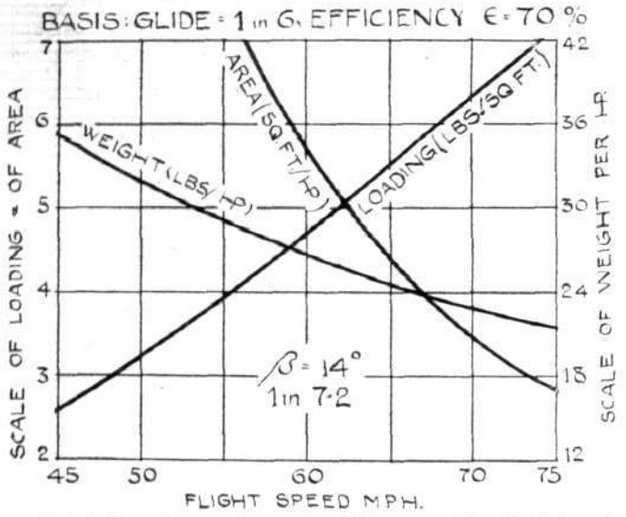
Whence k has a plausible value in the order of 2.

By keeping k constant, we can ascertain, by simple transposition of other values for X and W_1, the corresponding value of ϵG that will satisfy the equation; and, by further assuming that $G = 6$ remains constant, ϵ becomes an expression for the *anticipated* overall efficiency, not only of the transmission, but of the machine as a whole, because it now reflects the influence of G.

It seems to me probable that there is a fundamental dynamical basis on which the appropriate value of k might be established by theory alone, because it is obvious that (XW_1) would automatically increase in practice with an increase in the attainable value of ϵG; and possibly this change would take place in constant ratio. Already I have suggested that the relationship between the fundamental formulæ $\cdot 5mv^2/mv = \cdot 5v$ (*see* "Principles of Flight," p. 68 *et seq.*) may be the basis required.—A.E.B.

70 per cent., and for this reason I call the other constant ϵ, the "anticipated efficiency" of the machine.

In the Military Trials there were machines with $\epsilon = 45$ per cent. and $\epsilon = 120$ per cent., but those that did best among the monoplanes had $\epsilon = 80$ per cent., and the Cody biplane had $\epsilon = 65$ per cent. It is clearly a question to determine, therefore, what efficiency may reasonably be anticipated for any class of design; and this data, obviously, can only result from the careful compilation of accurate

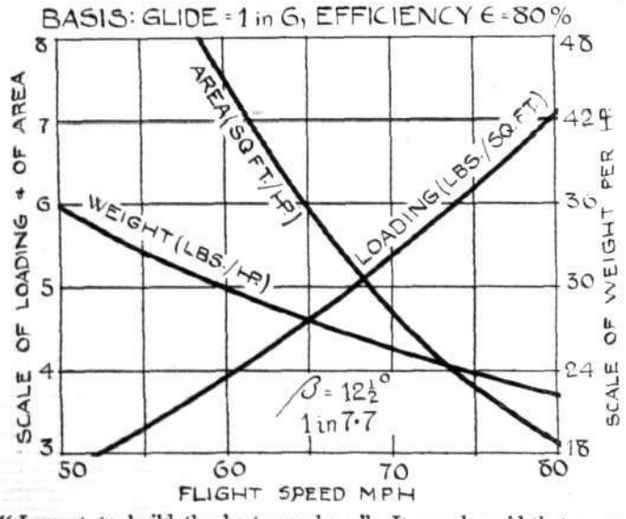


practical information such as the Military Trials afforded. At the moment I should say that a good monoplane may anticipate 80 per cent., if its main object is to fly very fast; and that a biplane, as ordinarily constructed, is most likely to realise its full virtue as a flying machine when designed for an anticipated efficiency of about 65 per cent. If the machine is designed to an unreasonably high value of ϵ, the wings will be so small for the weight that the climbing and speed range will both be curtailed; while, if the value of ϵ is unduly low, the large wing-surface that results will give unusual facility for slow speed flying and manœuvrability, but at the expense of absolute maximum flight speed.

So it would appear that there is a particular speed that is best for the particular purpose, and that there is a particular relationship between weight per sq. ft. and weight per h.p. that is best suited to attain it.

The question is how to arrive at these proper values when, instead of a machine that is already built, we seek for assistance from the figures to help us in starting upon a design.

In the first place it is obviously necessary to determine the object of the design with greater precision of detail than merely to say

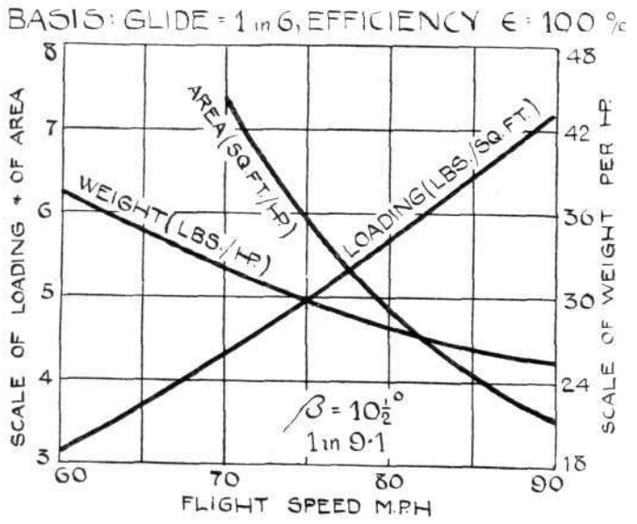


"I want to build the best aeroplane." It may be said that every entrant in the Military Trials regarded the adjective as applicable to his own machine, althought it is still more certain that the judges did not. For the purposes of this article I must assume that the object can be specified by deciding upon the efficiency to be anticipated, *i.e.*, to fix in advance the value of ϵ, and, indeed, at the moment, it seems to me that in the selection of a suitable ϵ the designer sums up his view of the situation in the most concise practical form that is possible. The selection of ϵ must, of course, itself be based on personal experience and study of the subject. Thus, it does not follow that the machine that is designed for the highest ϵ is the best for the purpose in view, as witness the selection of the Cody with $\epsilon = 65$ per cent. for first prize in the Military Trials when there were other machines with $\epsilon = 80$ per cent. which also realised their anticipations.

Another point of importance, too, is that the anticipated efficiency ϵ is not necessarily the limit of the machine's attainments, provided that the anticipation has been intelligently moderate, *e.g.*, a machine designed for $\epsilon = 65$ may perhaps demonstrate 70 per cent. or more. On the other hand, over great expectations or an unduly small claim in the matter of ϵ does prejudice the opportunities for high speed unfavourably.

With these explanations let us proceed to try and learn more about the relations that exist between the four factors of weight, power, speed and area, on the assumption that a definite value of ϵ has already been selected as the basis for the design. In order to facilitate this inspection, I have prepared a number of diagrams, each of which relates to a different value of ϵ, but all of which assume that the machine has a gliding angle of 1 in 6, and that the resistance remains constant independent of the speed, which is not true in itself, although it is a convenient basis for the purpose in hand.

On any chart, it is permissible to select any point on any one curve as the origin of the design, but, having done so, then the point on the other curve that lies on the same ordinate (vertical line) *must not* be exceeded. Thus, suppose we have in mind a fast monoplane with reasonable all round qualities that will weigh in flight about 1,900 lbs. and the purchase of a certain engine that is known to give say 80-h.p. (The fact that engines are only



available in certain sizes necessarily limits the choice, and makes it necessary to have some particular motor in mind from the very first—the area of the wings is really the only factor that can be adjusted precisely to the requirements.) The origin of the design is thus a load of 24 lbs. per h.p. approximately. Being a speed machine, the object of the design will be to realise the highest possible overall efficiency, which for the moment, and in the light of the Military Trials, we will assume to be 80 per cent. Turning, therefore, to the $\epsilon = 80$ per cent. chart, we find that a load of 24 lbs. per h.p. may be accompanied by 6·25 lbs. loading on the wings and should result in a flight speed of 75 m.p.h. The wings, therefore, should be 304 sq. ft. in area and have an effective angle of 12½°. To make them of less area than this is to anticipate a higher efficiency than 80 per cent., which, while it may produce a slightly higher speed, is certain to curtail the range and all round merit of the machine. If speed pure and simple is the basis of the design that includes a given motor there is, of course, no other solution than to strive after the highest possible value of ϵ, but whenever the anticipation exceeds the best values established by experience, the design courts failure and even, perhaps, disaster. Progress indeed must be encouraged, but the proper way to develop is from the sure foundation of a machine defined for an efficiency that is attainable by all, but so well designed that its actual performance outstrips its anticipations.

In effect, this is to say that a designer ought not to try and gain speed by increasing his wing loading until he sees his way clear to make an equivalent reduction in the total weight of his machine such as will leave ϵ unchanged. This principle is, of course, itself open to abuse, because it is affected by that very vital matter of the

factor of safety in the materials of construction. If it is unsafe to anticipate an exaggerated efficiency, it would be equally unsafe to ruthlessly sacrifice the factor of safety in order to reduce the weight of the machine to a value in keeping with a very small ϵ and the desired flight speed. It is clear that the manufacturer of aeroplanes must move warily, and X, x and ϵ will have served their purpose if they give him some little glimmer of light in the dark.

And now it is necessary to give, quite briefly, the details of the calculations on which the charts are based :—

1 h.p. = 375 mile-pounds per hour.

$\therefore$ $375 \times \epsilon$ = maximum power available per h.p.

Weight × gradient-angle = resistance to flight.

[The difference between the gliding-speed and maximum flight speed introduces an error in the assumption that the gliding angle = equivalent gradient of horizontal flight ; but the fact remains that the gliding angle is the best comparative figure of resistance at present available for several different types of machines, and as such is naturally a guiding factor in design. In any case, it is *essential* to design for some *gradient* angle, and it is for the manufacturer to make the choice in the light of the best evidence available. From the Military Trials, it is apparent that 1 in 6 is a reasonable figure, and the charts have therefore been based on this value.]

Thus :—

(Weight of machine in flight (lbs.) ÷ available power (h.p.) from engine selected) = load per h.p. (lbs.),

and, Resistance to flight per h.p. = (load per h.p. ÷ 6).

So, Maximum flight speed m.p.h. = $6(375\epsilon) \div$ (load per h.p.).

The next step is to find the appropriate loading for the wings, which is where the constants X and x come in so handily to simplify the calculation.

It will be remembered that—

X = (load per h.p.) × (loading per sq. ft.), and $x = X \div 2$.

Loading per sq. ft. = (max. flight speed) $\div \frac{1}{2}$ (load per h.p.).

$\therefore$ Wing area per h.p. = (load per h.p.). (Loading per sq. ft.).

The three calculations are graphically illustrated in the charts by the three curves.

There is also a subsidiary calculation that can be made from the chart, which gives the appropriate effective angle for the wings in each case.

Thus (referring to "Principles of Flight," p. 73, formula 10) :—

Loading per sq. ft. = $(V^2 \tan \beta) \div 200$.

$\therefore$ $\tan \beta = 200$ (loading per sq. ft.) $\div V^2$.

From which simple formulæ have been derived the values of the limiting effective wing angles attached to each diagram. For the meaning of "effective angle" in this connection, however, readers must refer to the book above mentioned, as the subject is too extensive to be a digression in the present place.

These wing angles are interesting as they indicate the relative amount by which the wings of a machine can be altered in angle in order to fly more slowly for the same amount of power consumed. That is to say, the degree to which increasing the wing angle alone will reduce the present known value of a machine's efficiency.

Again, each wing angle has its appropriate coefficient of flight (gliding angle) which for these charts ranges from more than 1 in 9 to less than 1 in 5. Thus, a good gliding angle implies a fine wing, which in turn implies a low loading or a high speed.

It must clearly be borne in mind that the charts give *limiting* values ; they establish a relationship that must not be exceeded, but, of course, they leave it open for a designer to keep as far below their standard as he can. It depends, as I said in the first instance, altogether on the point of view from which the design originates. If the object is to build a typical 80 per cent. efficiency monoplane, then the full values permissible according to the 80 per cent. chart may be taken. But, if the origin of design is to obtain a greater range of speed by the use of larger wings and a lower loading, on a machine that in structural design belongs to the 80 per cent. class, it does not mean to say that the modified dimensions will limit the maximum actual flight speed to the new value of x.

Thus, let us take the Farman as a case in point. This machine has a value of $\epsilon = 46$ per cent., but from its structural design there is nothing to indicate why it should not reasonably anticipate an efficiency in the order of 65 per cent., which is readily attainable by most biplanes. Its very large area is the only disproportionate factor in the situation, the loading being less than 3 lbs. per sq. ft.

Turning to the 45 per cent. chart it will be observed that the wings lift this loading at just under 40 m.p.h. (the gliding speed was 39 m.p.h. and the gliding angle 1 in 6·8), and turning to the 65 per cent. chart it will be observed that the load per h.p., which is just under 27, can be propelled at 55 m.p.h. for 65 per cent. efficiency and a resistance of 1 in 6. The actual maximum flight speed of the machine was, as it happened, 55·2, but the demonstrated efficiency was only 58. I do not pretend that these charts afford ready-made solutions to problems of this character, because a number of factors have to be considered that cannot thus simply be taken into account. They may, however, pave the way to something more useful in the future, and if they help firmly to establish in the minds of students a fundamental line of thought of the simplest possible mechanical order, the labour spent upon them will not altogether have been in vain, and the process of "thinking aloud" in FLIGHT from week to week during the height of the interest in the Military Trials, not wholly without some justification.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

Royal Flying Corps Fatalities.

The news of the sad accidents at Graveley and Oxford was received at the Club with great sorrow, and the Chairman, Sir Charles Rose, immediately forwarded messages of sympathy to the relatives of Capt. P. Hamilton, Lieut. A. Wyness-Stuart, Lieut. E. Hotchkiss and Lieut. Claude A. Bettington. The following message has been received from Major F. H. Sykes, Commandant of the Military Wing of the Royal Flying Corps :—

"All ranks thank Chairman and members Royal Aero Club very sincerely for kind message of sympathy."

Officials of the Club visited the scene of both accidents, and a careful examination of the wreckage was made. Reports will be submitted by them to the Accidents Investigation Committee, a meeting of which has been specially called for Tuesday next.

Dublin to Belfast Race.

The race from Dublin to Belfast was started at Leopardstown on Saturday last, but, owing to the unsuitable weather, the competitors were unable to reach Belfast. Astley and Valentine both managed to get as far as Newry, a distance of about 60 miles, when the weather conditions prevented them from continuing the race. The Committee of the Irish Aero Club decided to divide the first prize of £300 between Mr. H. J. D. Astley and Mr. James Valentine. Lieut. Porte was awarded the "Shell" prize of £50, Mr. Desmond Arthur a special prize of £25. A further sum of £40 was given to each competitor towards his expenses. Excellent arrangements were made by the Irish Aero Club, of which Mr. John Dunville is the chairman.

British Empire Michelin Competitions.

Intending Competitors are again reminded of the following prizes :—

British Empire Michelin Cup No. 1... ... £500 Prize.
British Empire Michelin Cup No. 2... ... £600 Prize.

The Competition for No. 1 Prize closes on October 31st, 1912, and No. 2 on October 15th, 1912.

The rules can be obtained on application to the Secretary.

Gift of Pictures.

Dr. W. J. S. Lockyer has presented the Club with two framed photographs of the Eastchurch Flying Ground, taken from a height of about 1,000 ft. from Mr. F. K. McClean's tractor biplane.

Mr. Esdaile has presented the Club with an original copy of a poster representing and describing (in Kanarese) the first aerial flight in Bangalore, Southern India.

166, Piccadilly. HAROLD E. PERRIN, Secretary.

FROM THE BRITISH FLYING GROUNDS.

Royal Aero Club Eastchurch Flying Ground.

ON Monday, last week, Lieut. Parke started the ball rolling by flying No. 2 with Private Edmunds as passenger, doing circuits of the island, whilst Capt. Gordon was giving instructional work to Lieuts. Seddon, Berne, Leading Seaman Russell and Warrant Officer Brownridge, this finishing flying for the day, the wind getting up. Tuesday, Lieut. Parke on No. 2 flew to Chatham, where he stayed to lunch and then returned and shortly after landing at the aerodrome he restarted for Herne Bay, Margate, Broadstairs and Deal with Engineer-Lieut. Briggs as passenger. Capt. Gordon flew Farman several times round the island. On Wednesday, Capt. Gordon flew the tractor machine T 5 for the first time, with a view to getting a little practice for the manœuvres. On Thursday morning about 6.30 a.m., Commander Samson started on the 100-h.p. S 41 for Hardwicke for manœuvres, but was forced to land at Henham on account of weather; he restarted on Saturday and arrived shortly after Lieut. Malone, who started on Friday morning on the 100-h.p. triple tractor and got as far as Upminster on Friday, when he was forced to descend owing to the failure of one of his engines. He restarted again on Saturday morning, making Hardwicke about half-an-hour later. Lieut. Grey and Capt. Gordon also started for Hardwicke at the same time as Lieut. Malone, Lieut. Grey being on 70-h.p. Deperdussin on which he made the most headway against the strong wind, but was forced to descend before reaching his goal, and in restarting fouled a net which damaged his landing gear and one wing. Capt. Gordon landed at Grays in a cabbage field owing to failure of engine, and after adjustments and pulling up four rows of cabbages for a "take off" got about 30 ft. up when he was caught by a bad gust which sent him to earth (he did not foul a hedge as stated in some of the "dailies"), damaging the landing gear and lower planes. He was unable to continue, and had to put back to Eastchurch for repairs. On Saturday, Lieut. Parke gave passenger flights to various members of the Service, and in the evening, when dark, started for Sittingbourne and Faversham, and returning to aerodrome, signalled by means of rockets from the machine that he was ready for the bonfires to be lit. A pilot fire was, of course, burning all the time.

Brooklands Aerodrome.

MONDAY, last week, there was quite a lot of flying done by many schools. The Bristols were out first, Mr. Hotchkiss on one machine and Mr. Merriam on another both giving tuition flights to Lieuts. Hanlon, Glanville, Carmichael, Fazil, Abdullah, Mr. Payze, Capt. Price. Capts. Boger and MacDonnell making straights alone. Mr. Cheeseman making figures of 8 very well. Capt. Miller and Lieut. Hope flying also well. Mr. Merriam was up high on the Bristol monoplane afterwards handing same over to Prince Cantacuzene, who flew very nicely, making good landings. Mr. Sabelli was on the Hanriot in the evening for about fifteen minutes going well over surrounding country.

At the Vickers School, Mr. MacDonald with Mr. Harding as passenger arrived from Salisbury, making an excellent spiral *vol plané* into the aerodrome. Mr. Knight on other Vickers machines giving tuition to Capt. Scott and Mr. Geere and then these pupils alone flying straights very well.

Mr. Harrison, on Tuesday morning, with a Bulgarian officer as passenger, flew back to Salisbury on two-seater Bristol monoplane and landed safely in a very puffy wind. At 5.15 a.m. Mr. Merriam was first out testing the air, and then up giving tuition to several pupils. Mr. Hotchkiss also out teaching. Capts. Miller, MacDonnell flying circuits very well, Lieuts. Hanlon, Carmichael, Glanville straights. Mr. Summerfield took his certificate in very good style. He flew a very steady course and landed each time within ten yards of mark. His flying does much credit to the school.

Mr. Cheeseman then away for his *brevet*, taking the first half splendidly. The second half he was flying exceptionally well but when making his last right-hand turn his engine failed, and he was forced to make an impromptu landing on the motor track, carrying away all the telegraph wires, but no damage to machine except a couple of chassis struts. Mr. Merriam was seen flying the monoplane very gracefully and after being satisfied that the machine was all right handed it over to Prince Cantacuzene, who has made excellent progress.

At 5 a.m. on Hanriot Mr. Sabelli was up about twenty minutes and then again for fifteen minutes. Very foggy on first flight.

Mr. MacDonald at the Vickers School took up Capt. Scott on No. 6 trial machine, flying very high. Mr. Geere also up with Mr. MacDonald and Capt. Scott doing straights, whilst Mr. Barnwell, Mr. Geere, and Mr. Knight were flying circuits on No. 3 monoplane and on the Farman biplane.

Wednesday, no flying. Thursday morning, 5.30 a.m., at the Bristol School, Mr. Merriam first out trying conditions with Mr. England as passenger, but found too windy for school work. In evening Mr. Merriam testing air with Capt. Gibbon as passenger. Weather still very bad for flying. Friday, Mr. Merriam went up and found conditions still bad. On Saturday, at 5.15 a.m., weather was a little better, and Mr. Merriam took up Capt. Penfold, and Mr. Payze, Capt. Price and Lieut. Parker. Mr. Bendall made solo followed by Mr. England. Pupils flying alone were Capt. MacDonnell, Lieuts. Carmichael and Glanville.

Vickers School were out in great force; all pupils flying circuits and straights well.

Mr. Sabelli, on the Hanriot, flew to Hendon at 3.30 a.m. in a strong wind, taking 28 mins. for journey, and winning second prize in cross-country race. He was presented by the London Aerodrome with a silver shield in recognition of his daring flight to Hendon. In the evening Mr. Merriam, at Bristol School, made a solo flight. Mr. Cheeseman followed for his ticket, which he flew in excellent style, landing with a *vol plané*. Mr. Barnwell, at Vickers School, doing circuits and figures of 8, making a splendid flight indeed. Other pupils also out.

Sunday was very windy, but as there was quite a crowd of spectators Mr. Merriam brought out a Bristol and made two circuits, afterwards taking Mr. England and the three-year old son of Lieut. Crossman for a short flight, which greatly amused the people. The Bristol was the only machine out for the day.

Eastbourne Aerodrome.

BAD weather was experienced on Wednesday last week, but a slight improvement on Thursday morning enabled the pupils to get in about an hour's work. Mr. Corbett-Wilson departed for Farnborough at 6.30 a.m., but had to descend at Lewes owing to plug trouble. Friday was rather gusty and none ventured out. On Saturday evening the weather conditions were perfect, and after making a solo, Mr. Hammond took up Mr. Lerwill and Lieut. Bone for straight flights, both made excellent progress, and by the end of

KING MANOEL AT HENDON.—King Manoel takes keen interest in aviation, and our photograph shows him, accompanied by his favourite "bull," upon a recent visit to the London Aerodrome. Accompanying the King, on the left, is M. Hugues Simon, the well-known French journalist, who is associated closely with aviation, and who conducted His Majesty over the aerodrome and through the various hangars.

the evening had got to the stage of doing half turns. No school work was possible on Sunday. Mr. Hammond made several solos in the evening but did not find conditions any too pleasant. Mr. Gordon England turned up on Monday and made some splendid flights during the course of the day. Messrs. Gassler and Foggin made one or two good flights on the 28th ult. Mr. Fowler was up on the Gnome and Mr. Hammond made several solos on the Bristol.

Farnborough (R.F.C.)

TUESDAY evening last week, although wind blowing quite a gale, Lieut. Carfrae on 100-h.p. Breguet and Lieut. Fox on BE 3, both making several good flights at a good height.

Next evening wind very gusty. Mr. de Havilland, with Major Brooke-Popham as passenger, on BE 2, Lieut. Fox, with Lieut. Charteris as passenger, on BE 3, both left for Hitchin. Bonneau out on new 28-h.p. Nieuport making several good flights.

Early Thursday Lieut. Mackworth several flights on new machine BE 6. Capt. Rayleigh, with Lieut. Wanklyn as passenger, on 100-h.p. Breguet left for Thetford, arriving safely. In the evening, Lieut. Mackworth on BE 6 with passenger. Cody made several circuits on his biplane, carrying passengers, in a very strong wind. On Friday, early, Lieut. Mackworth on BE 6, Capt. Reynolds on Maurice Farman, both taking passengers. Both machines being out again in evening flying until dark.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School.—Monday, last week, school started at 6 a.m., Mr. Hoelscher on No. 7 biplane doing good straights and making excellent landings. Mr. Mateyka, on same machine, while making a straight flight stalled machine in air and pancaked, smashing landing chassis and lower plane. Lieut. Small rolling on No. 1 biplane.

Next day Lieut. Allen on No. 1 biplane at 6.15 a.m. doing straights and half-turns. Mr. Roupell got in some good practice on the 35-h.p. Anzani-Blériot with some good straights and landings, later doing a circuit at about 40 ft.

Saturday, school out at 5.50 a.m., Lieut. Allen and Mr. Wilson doing straights on No. 7 biplane, and Lieut. Small rolling and long hops. Sunday, Mr. Marcel Desoutter started with his monoplane punctually to time, 3.30, and made a fine flight. Mr. Noel also gave some good exhibitions on the Henry Farman machine, occasionally taking up a passenger. At 6.30 Mr. Sabelli brought out his Hanriot, intending to fly to Brooklands, but unfortunately was unable to get away owing to engine trouble.

Blériot School.—Mr. Hall was the first out on Tuesday morning, last week, and soon after six went aloft to do the second half of his *brevet* tests, which he accomplished in good style, getting up to 300 ft. for his altitude test, observed by Messrs. Gill and Noel. Messrs. Sacchi, Welburn, Teulade and Clappen then went out on LB 3 for circuits and straights, whilst Mr. Reilly was rolling on LB 1.

Saturday, Mr. Sacchi was out early in morning doing straights on LB 3 before the wind rose. Mr. Hall tried his 50-h.p. Gnome-Blériot single-seater in the evening and was circling the pylons in good style. No other schoolwork possible owing to bad weather.

British Deperdussin School.—No flying all Wednesday, too windy. On Thursday morning, Messrs. Phelps and Whitehouse made excellent progress, rolling on Taxi No. 1 against nasty side wind. Gill got in four circuits on racer. Friday: Lieuts. Tucker and Hawker, Capt. Macdonnel, Messrs. Spratt and Phelps all rolling on Taxi No. 1. Gill 10 minutes on racer.

Capt. Macdonnel and Lieuts. Tucker and Hawker all doing straight flights on Taxi No. 2 Saturday morning. Messrs. Phelps, Whitehouse and Durand rolling on Taxi No. 1. Cadet Robinson straights on *brevet*. Gill a couple of circuits on two-seater

W. H. Ewen School.—The school has been out on every possible occasion during the last week and some splendid flying has been put in by the pupils.

On Monday, pupils out 5.30 a.m. and, under the instruction of M. Baumann, Lieuts. Bayly and McMullen and Mr. Eric Conran were making good straights and hops on No. 1 monoplane, and Messrs. Apcar and Gist also put in several good flights. Mr. Ewen on 35-h.p. Caudron, after which he handed the machine over to Mr. Sutton for practice. The wind rising put an end to the pupils' solo work and Mr. Ewen then took all the above pupils up for flights, and also gave passenger flights to Master Davis and Mr. Sydney Pickles, late of Brooklands, who was greatly impressed by the speed and lifting power of the Caudron.

When the fog lifted at 7 a.m. on Tuesday, Messrs. W. H. Ewen and Sydney Pickles were instructing pupils on the Caudron. Messrs. Sutton and Edmunds were flying confidently and Messrs. Apcar and J. H. James straights. M. Baumann on school monoplanes Nos. 1 and 2, on which Messrs. Conran and H. James and Lieuts. Bayly and McMullen did some capital flights. Following a flight on 35-h.p. Caudron, Mr. Sutton made several good flights on the same machine. Messrs. James, Conran, Warren and Gist along with Lieuts. Bayly and McMullen put in some further useful practice. To finish the morning's flying Mr. Ewen took several of the pupils up for air instruction on the two-seater.

Wednesday a blank day owing to the weather.

On following day conditions favourable for only short spell. This was fully taken advantage of and Messrs. Conran, H. James, L. Russell and Lieuts. Bayly and McMullen were out at 5 a.m. and made some good progress.

Friday, pupils out at 5.30 before wind rose. Lieut. Bayly and Mr. Eric Conran straights on monoplane No. 1 and Mr. L. Russell rolling. Mr. Ewen flying the 35-h.p. Caudron, after which Mr. Sydney Pickles made two nice flights on the same machine, finding no difficulty in his first flight on new mount.

A capital morning's work on Saturday from 5.30 a.m. till 7.45, all pupils making satisfactory progress. Lieuts. Bayly and McMullen and Messrs. Eric Conran, H. James and L. Russell on monoplane No. 1. Messrs. Apcar and J. H. James straights on No. 2 monoplane at an altitude of 30 ft. and Mr. Edmunds doing splendid circuit flight on same machine. After short test flight by one of the school instructors, Mr. Sutton made several good flights on 35-h.p. Caudron biplane. Mr. Ewen then brought out the 60-h.p. two-seater Caudron biplane and took Messrs. Sydney Pickles and J. H. James for passenger flights. Monsieur Galy, a distinguished French pilot of the Caudron, has now joined the school staff.

Salisbury Plain.

Royal Flying Corps.—There is not a great deal to report as so many of the officers are away for the manœuvres. On Wednesday Gordon Bell was on the Deperdussin mono., and on landing buckled a wheel. Lieut. Wadham was flying well.

Thursday saw Gordon Bell on a Deperdussin mono., which was damaged in landing. Lieut. Bettington was flying the Bristol monoplane across country, and had to come down at Hungerford owing to engine trouble. Mr. Raynham was on the Martin-Handasyde, and was also troubled with a refractory engine. 2nd Lieut. Hotchkiss, Reserve, was on Bristol monoplane, as also were Lieut. Bettington and Capt. Allen, while Lieut. Wadham was flying the Deperdussin. Owing to the fatal accident to Capt. Hamilton and Lieut. Stuart no flying took place on Friday or Saturday. On Sunday Capt. Connor was tuning up his machine preparatory to going to Farnborough, but the treacherous winds necessitated a postponement.

The weather was fair on Monday morning, and Lieut. Lawrence was out on FE 2 biplane, fitted with a Maxim gun. He did some flying around the camps, but the wind prevented cross-country work. In the evening Lieut. Wadham made an excellent flight on the Deperdussin at a height of 2,500 ft., finishing with a neat landing. Lieut. Lawrence made a flight on FE 2 biplane. Lieuts. Bettington and Hotchkiss and Capt. Allen were out on Bristol monoplanes.

Gordon Bell piloting the Martin-Handasyde mono. at Lark Hill, Salisbury Plain.

Tuesday morning Lieut. Wadham on the Deperdussin left for the manœuvres, but returned owing to one of the valves of his engine sticking. Lieut. Lawrence on FE 2 biplane went up, but came down at Andover with engine trouble. Capt. Allen on monoplane also came down at Summer Town. Second Lieut. Hotchkiss started at 7 a.m., when the weather was very dull, with Lieut. Bettington as observer, in a Bristol monoplane which took part in the trials. The engine was not working at all well, and they left at a height of 700 ft., travelling very slow. The fatal termination to this flight is referred to elsewhere.

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THE DUBLIN TO BELFAST EVENT.

BAD weather contrived to spoil the Dublin–Belfast race arranged for last Saturday by the Aero Club of Ireland, and the large crowds which gathered at Belfast to welcome the aviators had to depart disappointed after patiently waiting all day. More fortunate were the spectators at Dublin, as they at least saw all the four competitors get away, and also witnessed some exhibition flights by Salmet. From early morning a continuous stream of people flocked out from Dublin to the Leopardstown racecourse, which had been selected as the starting place, and every vantage point in the vicinity had its quota of enthusiastic watchers. Soon after 11 a.m. Mr. Astley made a trial trip on his Blériot, and the other machines were brought out for engine testing, but in view of the strong westerly wind, the start was delayed for some time. At 1.30 p.m. a message came through from Belfast that the weather was bad, there being rain and fog.

Soon after the proceedings were enlivened with a couple of circuits by Salmet, to be followed by a downpour of rain which drove everyone to shelter. This was succeeded by an unpleasant mist. At 4.25 p.m. the weather was a little more propitious, and Astley started on his Blériot monoplane, followed by J. Valentine on the 50-h.p. Deperdussin, Desmond Arthur on the 70-h.p. Bristol, and Lieut. Porte on the 100-h.p. Deperdussin. Arthur failed to get clear of the ground, and in landing buckled one of his wheels. Lieut. Porte found the conditions much too trying, and after going three miles, returned to Leopardstown. Astley and Valentine persevered through the vile weather, but conditions got worse rather that better as they went on, while to add to their difficulties daylight began to fail. Eventually Valentine came down at Newry, while Astley gave up at Drogheda. It was ultimately decided by the authorities that the first prize of £300 should be divided between Messrs. Valentine and Astley, plus £40 each for expenses; the £50 Shell Motor Spirit prize, plus £40 for expenses, to go to Lieut. Porte; and a special prize of £25, plus £40 for expenses, to Mr. Arthur.

THE DUBLIN-BELFAST AEROPLANE CONTEST.—Mr. H. J. D. Astley getting away on his 70-h.p. Blériot from Leopardstown, Dublin.

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FLYING AT THE MANŒUVRES.

WITH somewhere about two dozen aeroplanes detailed to take part in the manœuvres now being carried out in East Anglia, with many of them flying under secret orders, it is impossible to give an adequate account of their work. It is certain, however, that valuable information as to the "enemy's" movements have already been obtained by the aerial observers, while the pilots have had a number of exciting experiences. While flying from Salisbury Plain to Farnborough on Monday Capt. Austin had his machine capsized by a squall near Andover, and Commander Samson, when going from Brentwood, whither he had flown from Eastchurch on the previous day, was brought down by the wind at Henham, in Essex. On the Thursday evening Lieut. Fox tried to fly from Hitchin to Welwyn, but owing to the gusty winds had to come down at Wilbery Hills. On Tuesday Capt. Reynolds and Major Moss were forced through wind to land at Hendon on their way from Farnborough to Thetford, and Capt. Raleigh and Lieut. Wanklyn on a Breguet, while on a similar journey, had to land near Royston on account of ignition trouble. At the time of the accident to Lieut. Hotchkiss, Capt. Allen, who was also going from Salisbury Plain to Hitchin, landed at Cumnor, near Oxford, because of the gusty wind and engine trouble. He saw Lieut. Hotchkiss' machine pass over and commence to plane down, and thought it had made a good landing.

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NIGHT FLYING AT HENDON.

A UNIQUE programme is being arranged for a meeting which is to take place at the London Aerodrome, Hendon, on Thursday, Sept. 26th. There will be the usual exhibition flights from 3 o'clock—weather permitting—of course; and at 7.30 p.m. will commence the first illuminated flying fête. Each of the aeroplanes taking part will carry a powerful searchlight, in addition to side and rear lights, and they will also be outlined with hundreds of tiny electric lights supplied from portable accumulators carried in the body of the machine. On the roofs of the hangars there will be powerful naval searchlights to guide the airmen flying in the darkness above, and the pylons which mark out the one and a-half miles' speed course will also be brilliantly illuminated. Many hundreds of coloured lanterns will be used in the various enclosures and the bandstand, so that the aerodrome should present a remarkably novel and beautiful scene. During the evening there will be a display of fire balloons and fireworks, illustrating "War in the Air," and the effect produced cannot fail to prove extremely interesting and impressive. Amongst the aviators who are down to pilot the illuminated machines are Messrs. C. Grahame-White, R. T. Gates, Marcel Desoutter, Lewis Turner, Jules Nardini, Louis Noel, and J. L. Travers. On the Saturday following (Sept. 28th) the Naval and Military Meeting will be held.

THE ARMY FATALITIES.

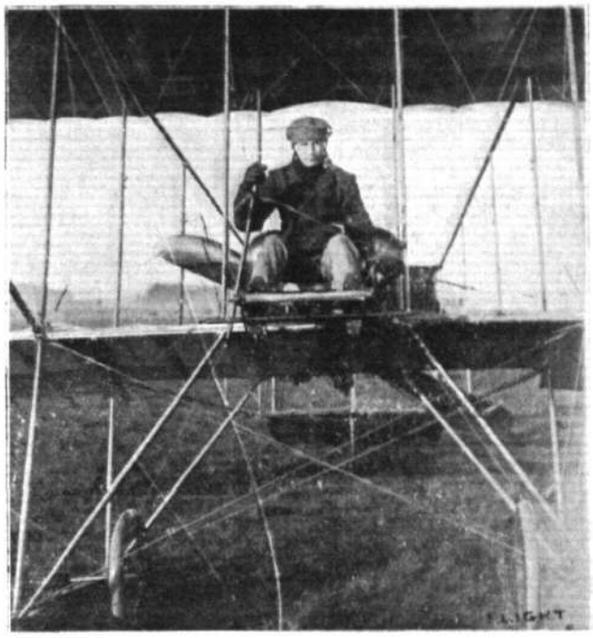
IT is with the very sincerest regret that we have to formally record the two calamities by which the Royal Flying Corps has been deprived of the services of four excellent pilots. We refer to the matter editorally on page 828.

The first accident, which involved the lives of Capt. Hamilton, the pilot, and Lieut. Wyness-Stuart, occurred on Friday last week at Graveley, near Welwyn. They were taking part in a reconnaissance in connection with the manœuvres, and had started at 6.10 a.m. from Wallingford, near Hitchin, to scout in the direction of Hardwicke. As far as Aylesbury the two officers, who were on the Deperdussin monoplane which had secured second prize in the recent Military Trials, were accompanied by Major Brooke-Popham on a biplane, who then went ahead. They were flying at an altitude of 2,500 ft. According to the evidence at the inquest the machine was noticed to be wobbling as it approached Graveley. There was then a loud report, and the machine collapsed, several parts being scattered as the machine fell. Both occupants were pinned beneath the wreck, and had apparently been killed instantaneously. At the inquest Mr. Fritz Koolhoven, of Regent Street, works manager of the British Deperdussin Aeroplane Company, said that in his opinion the accident was caused by a part of the engine coming off and hitting the bonnet over the engine, smashing one of the wing wires, and thus loosening the wings. When this happened the wings would double up, and the plane would fall. He was quite certain this was the cause of the accident, but which wire was hit he could not tell.

Major Brooke-Popham also gave similar evidence, and said he did not think the weather had anything to do with the accident.

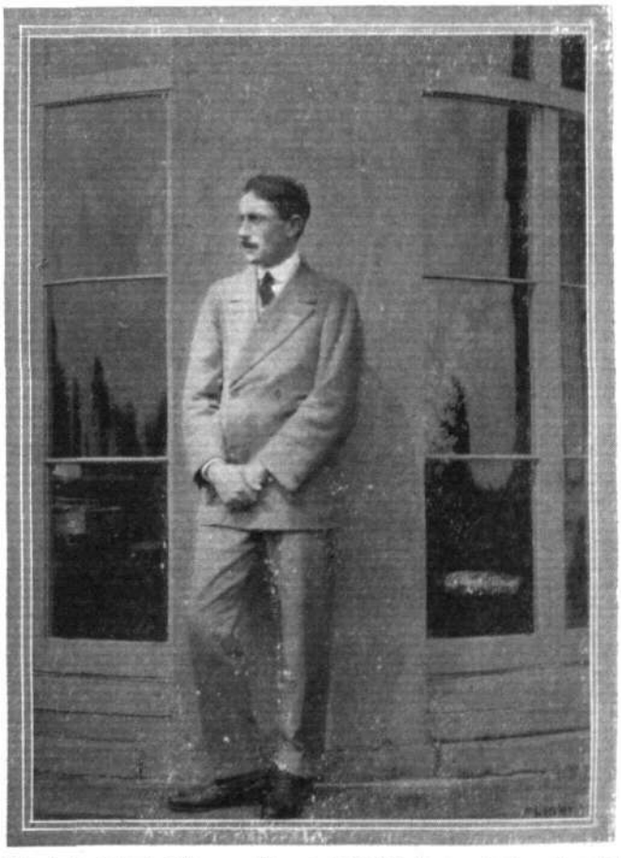
A verdict of accidental death was returned by the jury, which expressed its sympathy with the relatives and friends. They added that the deceased officers were brave men, and met the death of brave men. They hoped that their untimely end would not deter others from emulating their devotion to the interests of their King and country.

The second accident was on Tuesday last and occurred to a Bristol monoplane while being piloted by Second Lieut. E.



Second Lieut. Hotchkiss who was killed in company with Lieut. Bettington on Tuesday.

A memento of the late Capt. Hamilton, who was killed whilst flying near Hitchin with Lieut. Wyness-Stuart. This card was sent us by Capt. Hamilton and Mr. G. M. Dyott from America last year, where the two were flying at the time. Capt. Hamilton was one of the old pupils of the late M. Petitpierre at the Hendon Blériot School, and both he and Mr. Dyott, who was also a pupil of Petitpierre, had the greatest admiration for their helpful instructor, to whom they jointly presented a mark of their appreciation last August twelvemonth. By Capt. Hamilton's death the Army has indeed lost a valuable officer.



The late Lieut. Wyness-Stuart, R.F.C. (late of the Special Reserve Royal Artillery), who was one of the unfortunate victims in the terrible disaster which overtook Capt. Hamilton near Hitchin on Friday last week.

Hotchkiss, of the Special Reserve of the Royal Flying Corps, who was accompanied by Lieut. C. Bettington. Mr. Hotchkiss had been instructor at the Bristol School at Brooklands, at which Mr. Bettington had just qualified as a pilot. The two officers set out from Salisbury Plain soon after 7 a.m. and, as the last entry in the log showed, they were over Oxford at 8.13 and encountered a rain storm. At Wolvercote the machine swerved and this was followed by a load report, one of the officers was thrown out and the machine dropped. Both men were instantly killed, their aeroplane being utterly wrecked.

THE DREAM.

I WAS dining on Monday night with my friend S. F. Edge, whom I had not seen for some time and whose interest in aeroplanes does not even begin to resemble his concern in motor cars, which in the early days he turned to such good account to the furtherance of the British motor industry. He had not even read FLIGHT for several weeks, and when, in the early part of August, I suggested that he might like to go down to Amesbury and turn out at 4 o'clock some fine morning to see the flying, he decided that his arrangements for the brief holiday he was then about to take would lead him in an altogether different direction. So, you may judge that he can scarcely have anything of the real personal interest in flying men and machines that falls to the lot of those who, so to speak, march with the army. And yet, he proceeded to tell me a flying story that is quite unique.

"That was a terrible accident, which took place on Friday morning," said he, when I had finished telling him about my own doings of late, "and I had a singular experience myself at the same time that is rather interesting. As a rule, I am waked by an alarum clock, which keeps good time and invariably goes off at 7. Often, however, I wake of my own accord a little before that time and, having looked at the clock, generally lie still in bed again until it strikes, because frequently I find that I can think very quickly and very clearly during those few minutes.

"On Friday morning I waked up of my own accord and, finding by the clock that it was ten minutes to seven, immediately lay back in bed again intending to follow my usual plan. The next thing I knew, however, was being reawakened by the alarum from the midst of a dream of exceptionally vivid reality. I dreamed that I was standing with a friend in the hollow of a field watching an approaching aeroplane, which I saw from beneath in foreshortened perspective. Two things in particular impressed me, as it were subconsciously, about that machine; one being its extraordinary colour, it was in fact reddish brown, like the sail of a fishing smack, and quite different altogether from the usual white tone that I have always associated with aeroplane wings. It was a monoplane that I saw, and the other peculiarity that impressed me at the time was its unusually squat appearance, which I did not think due only to the foreshortened view that I had of it, but rather to some disproportion between the wings and the tail so that the wings were either small in proportion to the tail, or the tail large in proportion to the wings. I am not sufficiently accustomed to aeroplanes for my impression to have definitely translated itself into one or other of the alternatives, I merely tell you two facts that particularly impressed me as differentiating the machine that I saw in my dream from any that I have ordinarily observed in actual flight.

"And, it is evident that these facts were very pronounced to my perception, because even as I first saw the machine an accident was taking place. 'Look!' I said to my friend, 'it has lost headway,' and while I spoke, the wing on the pilot's left hand flapped upwards and the fabric of it seemed to me to bulge as if it were loose and had been caught by the wind. At the same time, the tail of the machine dropped, as if the machine were about to slide backwards, and so indeed I think it did begin to fall. I did not see it actually come to earth, but I felt, as it were, that it was falling behind a hill that seemed to rise in my immediate foreground. With the commencement of this last scene I awoke to hear the alarum going off by my side and a clock in a neighbouring church striking seven.

"So impressed was I with my dream, which was quite unlike a dream, so extraordinarily realistic had it been, particularly for example with respect to the colour of the machine, that I could not help looking through the morning paper to see if there was any account of an aeroplane accident. There was none, but later in the day I saw the placards announcing Capt. Hamilton's death and from the news in the later editions I learned that disaster had overtaken a monoplane at or about 7 o'clock that morning, because it was stated that Capt. Hamilton's watch had stopped at 7.3 a.m. So much have I learned, but no more, for I cannot find anywhere any account of the machine itself or any reference to its having been unusual either in design or colour and these unusual features I am afraid, must show, as I thought at first, that my experience was nothing but an ordinary dream after all."

"Well," said I, when he had finished his story, "that is a most remarkably interesting thing, and it may interest you to know that the machine in question was indeed a brownish red in colour and it had besides this further peculiarity in design, namely, the possession of a very large tail which, in conjunction with a rather short overall length as compared with the span, does certainly tend to give it rather a squat appearance in plan, although sideways the graceful lines of the body immediately belie this effect. The machine in question was the French Deperdussin of the recent Military Trials, and in common with other machines of this make is covered with a special finishing varnish that is made for the Deperdussin firm, who apply it over one of the standard varnishes that they use in the first instance."

"Thus, the Dep. monoplanes are probably the only machines in the world that have this curious colour that was so pronounced in the dream, which at first made you think the machine fantastical, but which is, in fact, the best evidence you could have offered in its identification."—A. E. B.

DANGER IN WING SURFACES.

A SOURCE of danger that gives us furiously to think is the possible ripping of wing surfaces in mid-air, as an accidental consequence of some other member of the machine having broken. Modern aeroplane wings, as at present constructed, rely wholly on remaining air-tight for their security. Virtually, the fabric is nothing but a bag tightly stretched over the wing framework. At intervals it is tacked down to ribs and spars, but its ability to support the loading and to transmit the stress on to the main booms through the agency of the ribs, depends on its bag-like form remaining intact. Being devoid of any principle of sectional structure, a torn under-surface has every opportunity to spread the damage, and if the wind gets into the plane through a gash, it is more than likely to tear the top fabric from its fastenings, and so to demolish the entire surfacing of the wing.

One report that was brought to us of the recent accident near Oxford, stated that the fabric was entirely torn off one of the wings, while the previous accident seems to have been primarily caused by the breakage of a part that might conceivably have torn the lower wing surface, although there is no reason for the moment to suppose that it did so. The point at issue is really less affected by the evidence of actual occurrences than by the consideration of whether or no the modern system of wing construction is in keeping with the principle of a factor of safety as applied to other parts of the machine.

A PRIVATE AERODROME TO LET.

SERIOUS experimenters in search of a good flying ground sufficiently removed from the public gaze to avoid the nuisance of an excessive audience, would do well to consider the opportunity that is afforded by Messrs. Handley Page's transference of headquarters from Barking to Cricklewood and Hendon, whither they have gone in order that they may more closely enter into touch with the business side of aviation.

The flying grounds at Barking, which are thus rendered vacant, possess many advantages that are not easily obtained near London. For one thing there is excellent shed accommodation, and if negotiations were commenced immediately, we believe arrangements could probably be made for many useful things to be left in situ.

A point of considerable importance, too, is the fact that the ground adjoins Barking Reach, where there is a stretch of water measuring about a mile by a-half mile in extent. Whether or no it is under the ban of special regulations with regard to flying we are not prepared to say, but there is no doubt that it would make an ideal headquarters for any firm deciding to take up the hydro-aeroplane business and anxious to establish a depôt near London. We should certainly advise those interested to lose no time about getting into touch with Messrs. Handley Page, whose address will be found in their advertisement, because we understand that they are willing to make very generous terms for the immediate settlement of the business.

BRITISH NOTES OF THE WEEK.

ROYAL FLYING CORPS.

THE following appointment was announced in the *London Gazette* of the 10th inst. :—

Special Reserve of Officers. Royal Flying Corps. Military Wing.—Montague R. N. Jennings to be Second Lieut. (on probation). September 11th, 1912.

The Admiralty and Aviation.

UNDER the new scheme approved by the First Lord of the Admiralty for the distribution of Admiralty business, the First Sea Lord has charge of the tactical employment of aircraft, while the design of aeroplanes and airships is in the department of the Third Sea Lord, who also supervises the Director of the Air Department. Contracts for aeroplanes and airships will be under the charge of the additional Civil Lord, but important orders will also be referred to the Third Sea Lord.

The "X" Constant.

OUR monthly contemporary *Aeronautics* does us the honour of recognising the originality of our Technical Editor's new constant X for aeroplanes, and we are not less interested in the frankly critical comment wherein it is described as "a new criterion of efficiency, which is so misleading from many points of view that, if it met with any acceptance, it might well effect untold harm. . . . The formula is a curious jumble and bears the obvious marks of undue hurry and laxity of thought."

Flying at Election.

ON Monday Mr. B. C. Hucks imported into the Midlothian election a spice of novelty by making flights over Dalkeith, Penicuik, Portobello and Edinburgh, distributing election literature during the trip. In the morning he went to the east, and in the evening to the west of the constituency, the latter trip lasting three-quarters of an hour. On Tuesday he completed his aerial tour of about 100 miles over Midlothian by a visit to the eastern side of the division.

M. Salmet in Dublin.

ON Monday some thousands of spectators saw M. Salmet fly at Dublin. In the morning he flew over from Leopardstown to Phœnix Park and back, and in the afternoon he was flying over the Vice-Regal and Chief Secretary's residence. He also made a circuit over Phœnix Park at a height of well over 1,000 ft.

The "Dope" on the Cody Winner.

AMONG the various refinements which helped to contribute to the success of the Cody biplane in the Military Trials it should not be overlooked that the planes were treated with "Cellon" which proved most satisfactory, rendering the planes both waterproof and oilproof.

Testing a Klaxon on an Aeroplane.

SOME details have been sent us by Mr. H. E. Shaw, of the Klaxon Co., concerning some trials made with a Klaxon horn mounted upon a Farman machine and piloted by Commander Samson at Eastchurch on September 2nd. Mr. Shaw tells us that the horn was temporarily fitted to a Farman biplane and continues his narrative as follows :—

"Lieutenant Hewitt was taken up as a passenger to operate the Klaxon by blowing it several times for two or three seconds at half minute intervals. The biplane was circled around the aerodrome at heights of from 400 to 500 ft., and when it was found that the horn could be clearly heard through the din of the 50-h.p. "Gnome" engine, Commander Samson went further afield, and at a higher elevation. At frequent intervals Lieut. Hewitt sounded the horn, giving signals by means of the Morse Code, these were clearly heard and "read" by those below, and at one period the signals could still be heard even when there were two other machines in the air besides, one of them a "Deperdussin" monoplane flying close by us at a low altitude. This test lasted fully half an hour, the Klaxon behaving most perfectly throughout.

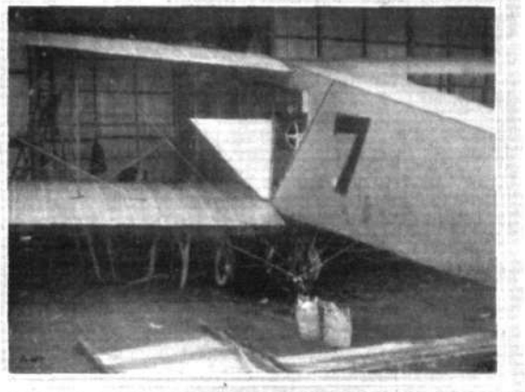


Photo by G. M. Part.

The Avro biplane in its shed after a flight in the Military Aeroplane Trials, showing the cabin door open through which access to the pilot's seat is obtained.

"When the Farman machine came to rest, we found that the barometer registered an altitude of 850 ft., and it was estimated that the circles made by the machine had a radius of from a mile to a mile and a-half, and that although the signals could be heard more clearly down wind, yet when the machine was returning up wind towards us, and fully a mile away, the sound could be heard quite well enough to be interpreted. All present were extremely pleased with such satisfactory results, but myself especially so, as the result of the test was even more convincing than I had expected."

WITH THE ROYAL FLYING CORPS AT THE ARMY MANŒUVRES.—A section of the aeroplane camp at Willian.

The I.C.S. Tour in Southern Counties.

IN spite of the rough weather, Mr. R. S. Slack, on the I.C.S. Gnome-Blériot, last week put in a good deal of work in the neighbourhood of Brighton. On Monday, Sept. 2nd, he flew from Shoreham, along the sea front, round the Brighton piers, and around Kemp Town to the Brighton racecourse, where the machine was inspected by members of the Corporation and others. He went back over Preston, to the Dyke, Southwick, and over the front to Shoreham, and did some exhibition flights in the evening. On Wednesday, Worthing and Goring were visited, the machine then going along the Brighton front to Rottingdean, and back *via* Portslade. Although the weather was very rough on Thursday, Mr. Slack ascended, trying to fly to Worthing to keep engagement, but had to give up after ascending to 700 ft. and remaining aloft 18 mins. The anemometer was registering 50 m.p.h. gusts. He kept his promise on Saturday, and flew to Worthing, descending near Broadwater Green. Later, he went over to Goring, and returned by Worthing front to Shoreham. Several exhibition flights at Shoreham on Sunday.

An Avro for Portuguese Army.

A 50-h.p. GNOME-AVRO, similar to those recently supplied to the British Army, has been ordered by the Portuguese War Office, and is to be delivered in a fortnight's time.

The Admiralty Orders an Avro Hydro.

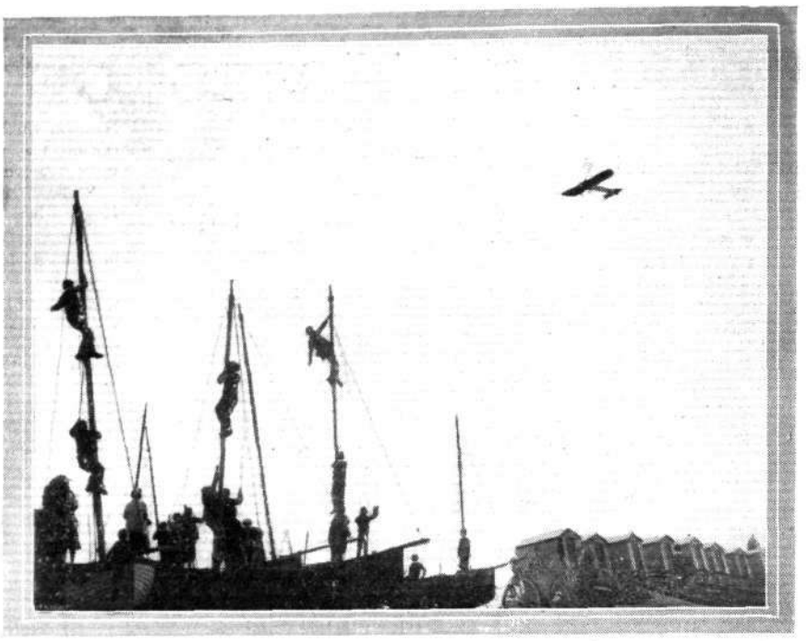
FOLLOWING the recent purchases of Avro biplanes by the British War Office, the Admiralty has placed an order for a 100-h.p. Gnome-Avro hydro-aeroplane. In general design it will be of the open military type, and will be fitted with disappearing wheels, &c.

The Scottish Aircraft Station.

BY way of making a start with the equipment of the aircraft base at Carlingnose, near the Forth Bridge, a Farman hydro-aeroplane was shipped on Saturday from Port Victoria by the s.s. "Beacon Light" to Rosyth.

Royal Congratulations for Mr. Cody.

AMONG the many congratulatory messages received by Mr. Cody on his success in the Military Trials, none was more welcome than that from H.M. King George, which was conveyed to the aviator in his shed at Farnborough by Sir Douglas Haig, Commander-in-Chief at Aldershot. In our last issue it was also announced that Mr. Cody had been awarded a Gold Medal by the Royal Aero Club.



Brighton youths determined to get a good view of Salmet during his flights in his Blériot monoplane at Brighton recently. During all the visits of the aviators to various places, no point of vantage has ever been left vacant by the watchers of the entertainment.

Mr. Cody's Plans.

BOTH the Australian and Austrian Governments have sent invitations to Mr. S. F. Cody to undertake the training of military aviators, but he hopes to remain in England and form a company to build a new biplane, which he has designed so as to be automatically stable. He may, however, go for a six months' trip to Australia.

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THE ELLIOTT INSTRUMENT BOARD.

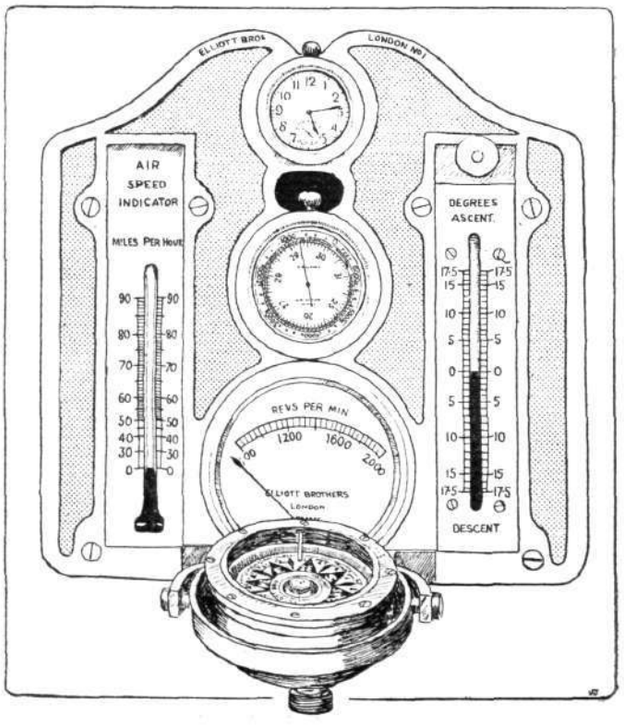
HAVING had occasion in our issue of August 31st to advocate the use of the Elliott instrument board on all flying machines, in order that pilots may get accustomed to flying by the clock, so to speak, instead of by their own impressions of speed and attitude, it may be as well to say what the instrument board in question is like, which we do by the aid of the accompanying sketch and following brief description.

In the centre of the board is an aneroid, scaled for both barometric and height readings, and supplied with a zero-setting device, by means of which variations in air pressure may be compensated for. Underneath this is a dial giving the engine revs. as recorded by one of Messrs. Elliott's well-known centrifugal-type revolution indicators. The upright scale on the left hand, calibrated in miles per hour and operating through a pressure device of the liquid type, is connected to a "Pitot" tube, the latter, on BE 2, being fitted on a strut between the main planes. The "Pitot" tube consists of two tubes placed side by side, one having its open end pointing forwards, while the other has an orifice at the side into which the wind cannot blow. Both are connected to the indicator, the effect of the second tube being to correct the reading of the first by differentiating between the pressure due to velocity and that due to the static condition of the atmosphere. In fitting a "Pitot" tube it is naturally necessary to secure that it is neither shielded by any part of the machine nor subjected to any cross currents or the like; and once fitted it should not be moved about, nor should any alterations be made to the machine in its immediate neighbourhood.

On the right of the board is an inclinometer, adjustable for slight variations in the flying attitude of the machine. This adjustment raises the calibrated face of the instrument from, or depresses it into, the face of the board.

Every possible part is made of aluminium, the dark part of the board being enamelled a dark green in order to show up the instrument faces, which are each and all of them finished with a dull aluminium surface.

The compass is to a certain extent a secondary consideration on this particular board and can be fitted or left off as desired, as many pilots prefer other positions for this important instrument.



FLIGHT

THE X CONSTANT.

By J. H. HUME-ROTHERY, M.A., B.Sc.

MAY I make the suggestion that instead of multiplying $\frac{W}{H.P.} \times \frac{W}{\text{area}}$ it might be more satisfactory to multiply $\left(\frac{W}{H.P.}\right)^2 \times \frac{W}{\text{area}}$, as this latter seems susceptible of a definite mathematical interpretation. If W be the weight of the aeroplane, S its area in sq. ft., V its velocity in ft. per sec., i the angle of attack, K a constant, so that

$$W = KSV^2 i \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

approximately. Then as usual

$$\text{Drift} = KSV^2 i^2.$$

Taking H as the coefficient of head resistance, so that

$$\text{Head resistance} = HV^2.$$

$$\therefore \text{Thrust} = V^2(KSi^2 + H)$$

$$H.P. = \frac{1}{550} V^3(KSi^2 + H).$$

Substituting for V from (1) we get

$$\text{Thrust} = \frac{W}{KS}\left(KSi + \frac{H}{i}\right) \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

$$H.P. = \frac{1}{550}\left(\frac{W}{KS}\right)^{\frac{3}{2}}\left(KS\sqrt{i} + \frac{H}{i\sqrt{i}}\right) \quad \ldots \quad (3)$$

If flying at the angle of attack for minimum thrust we get by differentiating (2) . $i = \sqrt{\frac{H}{KS}}$. If flying for minimum power we get from (3) . $i = \sqrt{3}\sqrt{\frac{H}{KS}}$. And the H.P. required in either case is got by substituting these values of i in (3).

$$\text{H.P. for minimum thrust} = \frac{2}{550} W^{\frac{3}{2}}(KS)^{-\frac{1}{2}}\left(\frac{H}{KS}\right)^{\frac{1}{4}}.$$

$$\text{H.P. at minimum H.P.} = \frac{\sqrt[4]{3} + \frac{\sqrt[4]{3}}{3}}{550} W^{\frac{3}{2}}(KS)^{-\frac{1}{2}}\left(\frac{H}{KS}\right)^{\frac{1}{4}} = \frac{1{\cdot}75}{550} W^{\frac{3}{2}}(KS)^{-\frac{1}{2}}\left(\frac{H}{KS}\right)^{\frac{1}{4}} \text{ q.p.}$$

Now following Capt. Duchêne, the factor $\frac{H}{KS}$ represents the proportion which the head resistance bears to the effective lifting power of the planes and he calls its inverse square root, viz., $\sqrt{\frac{KS}{H}}$, the *fineness* of the aeroplane $= f$. Substituting this we get

$$H.P. = \frac{2(\text{or } 1{\cdot}75)}{550} W^{\frac{3}{2}}(KS)^{-\frac{1}{2}} \frac{1}{\sqrt{f}}$$

$$\therefore \sqrt{f} \cdot \sqrt{K} = \frac{2(\text{or } 1{\cdot}75)}{550} \frac{W}{H.P.} \cdot \sqrt{\frac{W}{S}};$$

$$\text{or } f \cdot K = \left\{\frac{2(\text{or } 1{\cdot}75)}{550}\right\}^2 \left(\frac{W}{H.P.}\right)^2 \cdot \frac{W}{S}.$$

If ϵ is the efficiency of the propelling mechanism, so that $\epsilon \times \text{B.H.P} = \text{H.P.}$ as used in the above formula.

$$\therefore f \cdot K \cdot \epsilon^2 = \left(\frac{2(\text{or } 1{\cdot}75)}{550}\right)^2 \left(\frac{W}{\text{B.H.P.}}\right)^2 \cdot \frac{W}{S}.$$

Hence the constant obtained by multiplying $\left(\frac{W}{\text{B.H.P.}}\right)^2 \times \frac{W}{S}$ measures directly the product of three of the most essential factors of efficiency, the fineness of the aeroplane as a whole, the lifting efficiency of its planes per square foot, and the (efficiency)^2 of its propelling mechanism. In regard to this latter it seems as if one should deduct any surplus power of the motor, as shown by its climbing power, before inserting its H.P. in the formula.

[The above communication is of exceptional interest because it arrives at precisely the same results as I have obtained by the x and ϵ calculations, but by another method. Thus, in order to arrive at ϵ, the anticipated efficiency of the machine, X is multiplied by a constant ·5 to produce a new factor x, which represents the speed appropriate to the design, from which, by multiplying by the weight W and dividing by the horse-power is evolved the numerical value for ϵ. In fine, ϵ is a function of X times the weight per h.p. or may be otherwise expressed as $\left[\left(\frac{W}{H.P.}\right)^2 \times \frac{W}{\text{area}}\right]$, which is precisely what our correspondent has himself suggested.

His method of investigation is worked out in the most interesting manner from aerodynamic premises, whereas my own investigation into the true meaning of X, which resulted in the use of x and ϵ, was conducted partly by the aid of fundamental dimensions and partly from a known aerodynamic law. If, as seems hopeful, these aeroplane factors are really justifiable they should be of real use to designers, and at least they have the merit of being simple and straightforward calculations easily made and easily understood by anyone.—TECH. ED.]

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FOREIGN AVIATION NEWS.

France Wins the Gordon Bennett.

FOR the first time France has won the Gordon Bennett Aviation Trophy, the French representative Vedrines as a matter of fact having practically a "walk-over" on his Deperdussin monoplane. Great Britain was not represented in the race as Mr. Claude Grahame-White and Mr. Hamel were both unable to go across the Atlantic, while the Americans were unable to get their specially built monoplane, which was to have been piloted by Glen Martin, ready in time. Although there was a considerable wind blowing across the ground, in the neighbourhood of Chicago, selected for the contest, Vedrines made a start about ten o'clock and with his machine running in splendid fashion he covered the 200 kiloms. in 1h. 10m. 56s., the speed working out to about 105 miles an hour. His machine was fitted with a 140-h.p. Gnome driving a Chauvière propeller, and Oleo plugs were fitted. Previous winners of the Gordon Bennett have been Glen Curtiss at Rheims in 1909, Grahame-White in America in 1910, and Weymann at Eastchurch last year.

Garros Regains the Height Record.

SINCE the Austrian officer Lieut. Blaschke succeeded in beating the height record, Garros has waited for a favourable opportunity to regain it. The chance came on the 6th inst., when, starting from Houlgate, near Deauville, on the special Blériot machine built for the purpose, he climbed until the barograph showed a height of 5,000 metres (16,405 ft.). Starting at 12.45 p.m., in ten minutes' time a height of 2,000 metres had been attained, and although the machine was flying against the wind, and was kept headed in the direction of the sea, it was steadily carried inland. Garros carried a supply of oxygen on board in order to assist respiration at the great height, but this gave out when he was 4,000 metres high, still he kept on climbing until he had reached 5,000 metres. He tried to get beyond that, but owing to an ominous noise in the motor, he shut off and commenced to *vol plané* down, eventually finding a landing place at Bieville-en-Auge, close to Crevecoeur, about 12½ miles inland from his starting point. On examining the motor after the attempt it was found that one of the cranks had broken. Garros's previous record was 3,910 metres, while Lieut. Blaschke's height, which was attained with a passenger was 4,260 metres.

The Belgian Hydro-Aeroplane Meeting.

AT the opening of the Belgian Hydro-aeroplane Meeting at Tamise on Saturday last there was a good deal of wind and rain in the morning but Train was out on his hydro-monoplane, while Renaux on the Farman biplane took two, then three, and finally four passengers. This machine as well as the Nieuport with Weymann in charge, was again out in the evening carrying passengers. Sunday was the first day of the competition, but the weather was so bad that it was decided to postpone starting the tests, and to double the marks awarded in the tests on the following day. During the preceding night Renaux's machine, which had been unable to find room in the special hangars, put up for the event by Bessonmeau, had been left at anchor by the quay and was badly damaged, but repairs were put in hand at once and quickly carried through. Paulhan made several tests on a Curtiss machine and Weymann was also out on the Nieuport. On Monday morning the proceedings were enlivened by the sighting of a military officer from Antwerp on an aeroplane on which he returned without landing. In the morning Molla (R.E.P.), Paulhan (Curtiss), Gobe (Nieuport), Weymann (Nieuport), each made the navigability test after which the proceedings were cut short by the squally wind. Beaumont (Donnet-Levque), Renaux (Farman), Molla (R.E.P.) and Benoist (Sanchez Besa) each started in the afternoon, but on account of the wind did not do very much. During the day Beaumont made three flights of about twenty minutes each with one passenger. Renaux took two passengers for a 16-min. trip and in another flight for 21 mins., while four were taken for 19 mins. Chemet on a Borel made two flights of 10 and 17 mins. respectively, and Molle was up for 20 mins. On Tuesday a serious accident marred the proceedings, Busson's machine falling among some trees at Weert, about five miles from Tamise. The pilot and his mechanic were badly burnt through the wrecked machine catching fire.

The Pommery Cup Competition.

LEAVING Etampes soon after 5 a.m. on the 4th inst., on a Blériot monoplane, Baron Pasquier attempted to beat Bathiat's record for the Pommery Cup, but was compelled to stop at Fontainebleau owing to the rain. On the 6th inst., Guillaux made a great effort on his Clement-Bayard monoplane. He started from Bordeaux at 5.33 a.m., and at 8.25 a.m. reached Poitiers safely. He reported that the wind was very trying, but after replenishing he re-started at 9.10 a.m. in the direction of Orleans. At 11 o'clock he passed St. Ay, about 10 kiloms. from Orleans, and shortly afterwards ran into a squall. In attempting to land on very rough ground he so damaged the machine that he was compelled to give up.

New Duration and Distance Records.

FLYING a Maurice Farman biplane at Etampes, on Wednesday, Fourny succeeded in beating his own duration record of 11 hours, and Gobe's distance record of 460 miles, by covering 633 miles in 13¾ hours.

Maurice Farman at Etampes.

ON Monday, Maurice Farman, accompanied by Barbaroux, flew over from Buc to Etampes, in order to note progress at the recently installed branch of the Maurice Farman school.

A Two-Hour Flight at Etampes.

SOME very good flying was seen at Etampes on Monday, on both Maurice Farman and Henry Farman machines. Guy d'Autroche made a long circuit over Dourdan, Anthon-la-Plaine and Angerville, and Lieut. Briault was up for two hours.

The Michelin Target Prizes.

THE Aero Club of France has now officially awarded the Michelin target prizes to L. Gaubert. That of 50,000 francs was won by the performance on August 15th, when, from a height of 200 metres, twelve projectiles out of fifteen were landed on a target 20 metres diameter. The prize of 25,000 francs was won on August 11th, when, from a height of 800 metres, eight projectiles out of fifteen were dropped on a rectangular target 120 metres long by 40 metres wide. The machine used was an Astra-Wright fitted with a Scott bomb-dropping apparatus.

Another Deperdussin Superior Pilot.

FOR his second triangular cross-country test for a French superior certificate, Lacrouze, on Monday, covered a course comprising Amberieu, Chalons and Macon, keeping his Deperdussin at an average height of 1,000 metres. His time for the 210 kiloms. was 2 hrs. 10 mins. in a similar flight on the preceding day.

A French Officer Killed.

WHILE making a cross-country test from Douai to Sissonne Camp for his superior military *brevet* Lieut. Chanteniers met with an accident which ended fatally on the 28th ult. The machine fell at Barenton-sur-Serres, close to Laon, and apparently the crash caused the petrol tank to burst. The escaping petrol ignited and before assistance could reach the unfortunate aviator he was burnt to death.

Death of a Nieuport Pilot.

TYPHOID fever has claimed another aviator as a victim. One of the most promising Nieuport pilots, Barillon, passed away from this cause on Wednesday week in the hospital at Chalons.

A Certificate for Hydro-Aeroplane Pilots.

THE question of issuing a special certificate for pilots of hydro-aeroplanes has been considered by the Aero Club of France and it has been decided to issue a temporary *brevet* and in the meantime refer the matter to the next Conference of the Fédération Aéronautique Internationale.

Labouchere Trying for Superior *Brevet*.

ON his Zodiac biplane, Labouchere, on Monday, made one test for a superior certificate by going from Villacoublay to Mourmelon.

Flying Four Hanriot Machines in Company.

ON the 3rd inst., Lieuts. Menard, Marlin, Clerc and Germaine, each piloting a Hanriot machine, started from the Rheims Military Flying Ground, and after a fast trip landed at Etampes. From there they continued on their way to Pont Levoy.

Mdlle. Dutrieu has a Fall.

WHILE flying a hydro-aeroplane from Geneva to Lausanne on the 2nd inst., Mdlle. Dutrieu met with a mishap. The motor suddenly stopped, and in some way the aviatress seems to have been thrown from her seat. The machine was badly damaged by its fall, but Mdlle. Dutrieu was picked up by a motor boat little the worse for the adventure.

Cross Country on a Clement-Bayard.

HAVING flown over to Compiegne for the hunt on the previous Sunday, Gastinger, on the Clement-Bayard monoplane, started off on the 3rd inst. for Issy, and passing over Paris at a height of about 800 metres, arrived safely in five minutes under the hour.

A New R.E.P. Superior Pilot.

ON his R.E.P. monoplane Lieut. Bruguiere, on the 3rd inst., started from Buc in a qualifying flight for a superior *brevet*. He reached Chartres safely, and later continued his journey to Orleans, eventually returning to Buc.

Testing New Henry Farman Machines.

AT Buc on the 3rd inst., Chevillard was testing two new Henry Farman machines for the French Army. On one he went up for 600 metres in 8½ mins., while in the other he got up 590 metres in 8 mins.

A Disaster in France.

THE terrible catastrophe at the Gray Aerodrome, near Dijon, on Sunday last, once more emphasises the grave responsibility resting upon aerodrome proprietors of seeing that the public are adequately protected. In this case the pilot started off across the ground but the machine failed to rise in the air, and breaking down the wire fence, mowed a way for itself through the crowd before overturning. In view of the large number of spectators, it is surprising that so many were able to get clear of the machine. Four people were killed, including two ladies, while eight people were taken to the hospital with various injuries. The pilot, Pierre Biard, escaped with but slight injuries.

Fast Trip on a Borel.

FOR the last test for his military *brevet* Lieut. Roeckel started from Buc on the 4th inst. and flew to the Mailly Camp, covering the 150 kiloms. in 1 hr. 5 mins. He returned to Buc later.

Good Work at Farman School.

IN view of the forthcoming French manœuvres, a lot of very good work has been done on Farman machines at Buc. On the 4th inst., Henry Farman, with a passenger, was testing his new machine, and Chevillard flew over to St. Cyr to pick up Sapper Seguin, who was to take back a new machine to St. Cyr. Among the officers flying were Capts. Bares, Michaud and Lieuts. Cheutin, Couret, Mouchard and Drouot. After taking up several passengers, Capt. Bares went over to Sens. Sergt. Carus flew for an hour; Sergt. Seyssel, with a sapper, arrived from Verdun; and Sergt. Hurard and another sapper made a long flight over the country.

Cross-Country Work on Blériots.

ON the 4th inst., Commandant Felix went on his Blériot from Etampes to Egreville, a distance of 100 kilometres, and returned in the evening. Sergt. Peretti went from Etampes to Avor Camp, while Deneau arrived at Etampes from St. Cyr to take delivery of a new machine for the manœuvres.

The Farman Brothers at Buc.

BOTH Henry and Maurice Farman were busy testing biplanes at Buc on the 6th inst. Both machines were of improved type, and that of Mr. Henry Farman was fitted with a new chassis, with which several landings were effected on ploughed land with satisfactory results.

A New Blériot Superior Pilot.

ON the 7th inst., Lieut. Dupin left Etampes on his Blériot machine, and succeeded in flying the 300 kiloms. to Tours, this counting as one of his tests for a superior certificate. On the same day Lieut. Gaubert, also on a Blériot, went from Etampes to Tournon St. Martin in 2 hrs. 20 mins.

Quick Climbing on a Caudron.

AT Crotoy, on Monday, Gaston Caudron, on a military machine fitted with a 70-h.p. Gnome motor, with a full load and a passenger, climbed 520 metres in 4 mins. 20 secs.

German Hydro-Aeroplane Meeting.

THERE is no doubt that the first German Hydro-Aeroplane Meeting which concluded at Heiligendamn on the 5th inst., must be written down as a fiasco, partly due to the weather, which was all against the aviators. As a result of the poor attempts for the week by the three or four competitors, the prizes offered by the Emperor, the Grand Duke of Mecklenburg-Schwerin and Minister of Public Works could not be awarded. We referred to the attempts at flight during the first few days in our last issue, and on the 4th inst., Buchner got his machine up to a height of 250 metres, but had to make an enforced descent on the water, while Von Gorrissen tried hard, but vainly, to get his machine in the air. At the conclusion of the meeting on the following day, consolation prizes ranging from 3,000 to 7,000 marks were distributed among the competitors.

A German Officer Killed.

WHILE Lieut. Steger was practising on a biplane over the Oberwiesenfeld aerodrome in Bavaria on the 6th inst., the machine was caught by a gust of wind and fell from a height of 300 ft., the aviator sustaining such injuries that he died shortly after.

Aviators in Austro-Hungarian Manœuvres.

IT is stated that thirty military aviators have been detailed to take part in the forthcoming manœuvres of the Austro-Hungarian army which this year are to be held in Hungary.

Long Hydro-Monoplane Flight in Switzerland.

ON the afternoon of the 4th inst., Grandjean on a hydro-monoplane built by himself and fitted with an Oerliken engine, fulfilled the conditions of the Eynard prize which was offered in 1909. He went from Chillon to Versois in 56 mins. 16 secs., making the obligatory landings at Ouchy, Rolle, and Coppet. He thus stands first for the prize which, however, remains open until the end of the year.

Flying Among the Alps.

SOME very fine flying was seen at Lugano on Sunday, when Maffei took his Blériot machine to a height of over 3,000 ft., and then glided down almost to the surface of Lake Lugano. He repeated this performance several times and also piloted his machine round Monte San Salvatore and Monte Bre.

A Grecian Altitude Record and Disaster.

ALEX. CARAMANLAKI last week succeeded in improving on his own altitude record for Greece of 2,140 metres by getting up, on his Blériot monoplane, to a height of 3,050 metres. The ascent took just under an hour, while the descent by a *vol plané* occupied 11 mins. While flying from Athens on Tuesday the machine fell into the sea near Corinth and the pilot was drowned.

Belgian Army and Aviation.

THE Belgian Minister of War is including in his Budget for 1913 a sum of £20,000, which is to be used in the purchase of aeroplanes to be distributed between the military stations at Antwerp, Liege and Namur.

A Maurice Farman Biplane in Portugal.

OPORTO had its first sight of an aeroplane on Sunday, when Trecaries steered his Maurice Farman biplane over the town; in a second trip he being accompanied by a passenger. Flights were witnessed by the President of the Republic, the Governor of Oporto, and other important government and municipal officials.

Russian Army has a "Demoiselle."

ALTHOUGH nothing has been heard of the Santos Dumont Demoiselle type of machine for some time it is understood that the Russian army has recently taken delivery of a Clement-Bayard machine of this model and tests are to be made with it at Moscow.

The Russian Military Aeroplane Trials.

AT the opening of these trials on Saturday last a dozen machines, representing seven different types, were down to compete. The machines were Gakkel, Kennedy, Meller, Blindermann, Porokhovchtikoff, Khioni, and Fokker. The last named is the well-known German machine, and its pilot was the only one to make a start in the tests by fulfilling the height requirements.

Vedrines to Teach American Officers.

A REPORT from Chicago states that Vedrines has been engaged by the U.S. Minister of War to give instruction in flying to American military officers.

Two Well-known Ae.C.A. Members Resign.

SOME stir was caused in New York aviation circles at the end of August by the announcement that two prominent members of the Aero Club of America had resigned. One was Mr. A. Leo Stevens, one of the original organisers of the club, and the other was Mr. Charles K. Hamilton. The action of the former was said to be due to the refusal of the club to send official observers to Hicksville L.I. to witness an attempt on the passenger-carrying record by Harry B. Brown, a Wright pilot for whom Mr. Stevens acts as manager. The club intimated that the trial should take place at Hempstead Field, its official ground. Mr. Hamilton, who in addition asked that his name might be erased from the list of licensed pilots, resigned apparently over the dispute concerning his suspension for taking part in the unsanctioned Boston meet, which he says he was led to believe had been duly licensed.

Orville Wright Has a Mishap.

WHILE experimenting with a hydro-aeroplane on the Miami River, about seven miles south of Dayton, O., on August 21st, Orville Wright met with an accident. He sustained a number of cuts and bruises, and the machine was somewhat damaged.

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PROGRESS OF FLIGHT ABOUT THE COUNTRY.

Model Clubs: Name of District only given. In brackets: Secretary's address.
Notes regarding Clubs must reach the Editor of FLIGHT, 44, St. Martin's Lane, London, W.C., by first post Tuesday at latest.

Aero Models Assoc. (N. Branch) (15, HIGHGATE AVENUE, N.).
SATURDAY, flying by B. Brown, L. Tosh and H. E. Fletcher (5½ ouncers). Sunday, at Finchley, H. E. Fletcher 500 and 510 yards; L. Tosh 430 yards and 50 secs. Flying to-day (Saturday).

Birmingham Aero Club (8, FREDERICK ROAD, EDGBASTON).
SEVERAL good flights carrying a passenger with the full-sized glider week before last. The half-size glider, built by the junior members of the club, also made good flights, towed. Two other full-sized biplane gliders are now under construction, and a power driven 30-h.p. biplane is also being designed, the engine, which has already been through its preliminary tests satisfactorily, being built by one of the members.

Blackheath Aero Club (48, HAFTON ROAD, CATFORD, S.E.).
SUNDAY, a strong wind, but good turn out of 15 at Blackheath, with 19 models (12 r.o.g.), including two single tractors. The advent of the more scientific model, compared with the flying stick, has evidently impressed the members. Flying this week-end Grove Park and Blackheath.

Brighton and District ("KINGSLEIGH," KINGSWAY, HOVE).
RISE-OFF-GROUND and duration competition September 14th, Shoreham Aerodrome, 2.30. Prizes to be divided out of funds and entrance fees. Particulars from secretary.
Saturday, at Shoreham, Williams, rise-off-ground 32 secs.; Knowles and others also flying. At Marine Park, Hervey (46 secs.), von Wichmann and White. R.o.g. and duration competition Shoreham, September 21st, 2.30.

Bristol Model Flying (3, ROYAL YORK CRESCENT, CLIFTON).
SEPTEMBER 21st, competition at Sea Walls, 3.30. Prize by assistant secretary (Mr. R. M. Haines) for first flight across the Gully. October 12th, competition at Filton. Non-members apply to the hon. secretary for particulars.

Chislehurst & Dist. Ae.C. (JASMINE COTTAGE, CHISLEHURST).
AT a meeting held August 28th, the above club was formed. Flying every Sunday afternoon and evening on cricket ground and Chislehurst Common, near "Monument." Members have use of large workshop. For particulars apply hon. sec.

Colwyn Bay Model Aero Club (FARNDON, COLWYN BAY).
RESULTS Saturday week competition at Woodland Park for raising-off-ground models. 1st, Fred. Jackson, 29 yds., with his 1-2-P2; 2nd, Dan Allen, 16 yds., flying a 1-2-P2. September 14th, meeting aerodrome, Upper Colwyn Bay, 3 p.m. Prize to be given by Mr. D. Bartlett.

Hackney and District (THE HOLLIES, 47, JENNER ROAD, N.).
OFFICIAL durations: Louch, 63 secs. (0-1-1 P2); Vans, 60 (1-1-0 P2), 48 (1-2-0 P2); Marmin, 58 (0-1-1 P2); W. A. Dore, 58 (1-1-0 P2); Horsfield, 57 (0-1-1 P2); S. Dore, 48 (1-1-0 P2); Carter, 42 (1-1-0 P2); Herron, 37 (0-1-1 P2); Burton, 28 (1-1-0 P2); Lewin, 28 (1-1-0 P2). Special meeting at Spensley Hall, Brooke Road, October 4th, to consider the disbandment of present club and formation of new one on different lines.

Hendon Model Aero Club (8, MONTAGU ROAD, W. HENDON).
RESULT of Saturday's club records meeting:—Duration, Doidge; distance, Hills. Lawrence, Short, Barton (altitude model), Brown and Hayward also flying. Next day Hills raised club duration by 9 secs. Flying evenings and week-ends as usual.

Leeds Model Aeroplane Club (5A, HULLAND ST., HUNSLET RD.).
AT a meeting, when 50 persons were present, on August 28th, at the Dolphin Hotel, Vicar Lane, it was decided to form a practical aero club, with annual subscription, 5s. for Leeds and District, 35 members were enrolled. Members will be taught the construction of aeroplanes, the handling of aero motors, the assembling of aeroplanes prior to flight, &c., and actual flying. A ground has been secured, the central aerodrome measuring 600 yards by 600 yards, on which it is proposed to erect hangars, &c. It is surrounded by other large fields of equally good surface, the only divisions being low hedges. Model flying competitions will be held monthly. A workshop will be erected. Two machines, a monoplane and a biplane have been placed at the disposal of the club by a London gentleman. Anyone interested in the new scheme of reduced membership and tuition fees, should apply for particulars to Mr. Tom Walker, of 5A, Hulland Street, Leeds, who has been appointed hon. sec., *pro tem.*

Reigate, Redhill and District (8, BRIGHTON ROAD).
BURGHOPE getting excellent results from hydro-tractor biplane week before last. Others flying: Norton (hydro-aeroplane), Morris, May, Sutton, Bond, Greenhead and Jordan. Rawson Cup, September 21st. Conditions: Distance, duration, steering to 100 yards point, same model and same power throughout, result on points.
Norton tuning up hydro P2-1-1 (boat type). Burghope off water with single-tractor hydro-biplane P-2-1. Much flying nearly every day. 38-oz. Nieuport going strong. Sutton, 61 secs. with light 1-1-P2. Owing to kindness of Messrs. H. and A. Trower, club can fly at "Wiggie."

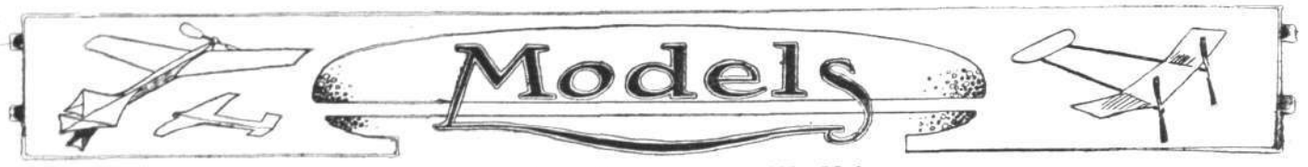
Scottish Ae.S. Model Aero Club (6, MCLELLAN STREET, GOVAN).
ANNUAL general meeting was held on 5th inst., at headquarters, Engineer's Institute, Col. J. A. Sillars presiding. Prize winners for past year.—Aggregates: distance, Mr. Jas. C. Balden; duration, Mr. Wm. G. Langlands. Lectures on aviation and aero models are to take place during the winter months, also competitions for flyers, self-rising models, hydro-aeroplanes, kites, &c. The club's premises now consists of fully equipped workshop at 18, Holland Street, and use of library, lecture, and reading rooms, and smoking lounge, at the Institute of Shipbuilders and Engineers, Elmbank Crescent. To-day (Saturday), model hydro-aeroplaning at the pond, Alexandra Park, Dennistoun. Next Saturday at Paisley Racecourse, competititon for distance and duration aggregate prizes.

Sheffield Model Aero Club (35, PENRHYN ROAD, SHEFFIELD).
COLVER Cup competition for self-rising models, to-day (Saturday) at Marsh Farm, High Lane, Eccleshall, 3 o'clock. Results September 7th: Master C. E. Worrall, 32 secs.; G. H. Dewsnap, 22½; E. Elliott, 18. After contest J. P. Worrall obtained 49 secs. Mr. E. W. Colver, the president, has offered club a one-cylinder petrol motor and coil for experimental purposes.

South Norwood (240, HOLMESDALE ROAD).
DURING week flying by Horricks tractor. Webb, Wise, Streeter (Clarke type and scale Dep.). The club has now got new workshop at 37, Clifford Road.

Windsor Model Flying (10, ALMA ROAD, WINDSOR).
FLYING Saturday by Barton (tractor mono.); Dowsett (biplane); S. Camm (hydro); Stanbrook, J. Camm and Hamblin. Glider expected out to-day week.

Yorkshire Ae.C. (Model Sec.) (53, WEST STREET, LEEDS).
MODEL section competition result at Beeston: 1st, Sutcliffe; 2nd, Holmes. Competition to-day at Roundhay Park.



Conducted by V. E. JOHNSON, M.A.

Hydro-Aeroplanes.

The Utility of Experiments with Models.

DURING the past month or two it has been my good fortune to have seen a very large number of experiments and actual flights with these models—the models themselves varying in weight from 5 or 6 ozs. up to nearly as many pounds. The type of the model has also varied as much as the weight. In this article I propose, therefore, to endeavour to draw a few general conclusions. Firstly, and more especially, with respect to the models themselves, and secondly as to the utility of such experiments with respect to full-sized machines.

The problem of the hydro-aeroplane naturally divides itself under three distinct heads :—

(*a*) The rising from the surface of the water.
(*b*) The actual flight in the air.
(*c*) The alighting on the water at the end of the flight.

With regard to (*a*)—the problem may be considered as solved both with respect to a model aeroplane supported on more or less punt-like floats, and what, for the present I prefer to call the true hydro-aeroplane. The difference between the two is this—the first type is almost invariably a biplane—as a matter of fact I can call to mind no exception to this — *i.e.*, it is well surfaced — and rises from the water *chiefly* owing to the dynamic lift of the planes — or to express it a little more clearly, the wings lift the floats out of the water, whereas the second type which carries much less aerofoil surface, the floats rise of their *own reaction* on to the surface of the water before the wings are ready to carry their entire load. The combined action of wings and floats can, of course, never be separated ; and when once in free flight its hydroplane surfaces become more efficient aeroplane surfaces than the other type, for exactly the same reason that they were originally more efficient as hydroplane surfaces.

But little consideration is necessary to demonstrate that successful free flight will be easier of attainment with the first-mentioned type than the second—I refer here to average and not to individual flights. The results of the two competitions which have been held —to the second of which I trust to refer more specifically in next week's issue—fully confirm this. The reason is fairly obvious ; in free flight the aeroplane action of the float surface is quite secondary to the aeroplane action of the wings themselves ; the stability, chiefly longitudinally, is less affected, and (always having regard to average results) this type claims initial success. Exactly the same thing occurred in the case of full-sized machines.

The type of model referred to is of the loaded elevator type, which is well known as the easiest to fly successfully. The problem then of successful free flight through the air, *i.e.*, (*b*), can also be considered as solved, although not perhaps quite so completely as (*a*).

Passing on to (*c*)—the solution here is only very partial—I have not kept any record of the actual number of *landings* of models on the water that I have seen, but it cannot altogether be far short of a hundred, and very possibly exceeds that number. The number of what could be really called anything like perfect landings is extremely small and certainly does not exceed a dozen—even if it reaches that number—and the majority of these were made in more or less calm air.

It was very interesting and instructive to watch, at the recent competition, quite a number of the models gliding down and oscillating laterally while so doing—if the model struck the water when the oscillation was at the lowest point of its swing it almost always remained upright—if at any other point it invariably upset.

The question of the amount of lateral flotation which should be given a machine, whether model or otherwise, is of primary importance. Almost without exception it would at present appear to be quite insufficient. Constructional difficulties, of course, come much to the fore in the question. In the case of a small model it is, of course, possible to fasten the floats to the wings themselves, but such would certainly not be possible in the case of a full-sized machine (balancers, but not the actual floats themselves), and to employ a constructional principle in the case of a model which could not be adopted in the case of a full-sized machine is of no use in practical aviation.

So long as the machine has any way on it, *i.e.*, is travelling along over the surface of the water, it is far less likely to be upset by any side-gust than if merely floating on its surface—due to, say, a forced landing owing to engine trouble.

One possible, and it appears to me quite feasible, way in which such a danger might be much lessened, presuming the lateral flotation limited by constructional difficulties, is by means of a small mast and sail—so arranged as to be quickly erected in case of emergency, which would keep the machine head on, or rather tail on, to the wind, and give it at the same time some forward motion, thereby rendering it less likely to be upset laterally, or driven backwards, with the possible result of hydroplaning *under* the water instead of off it. But a machine, model or full-sized, can upset not only about a lateral or longitudinal axis, but about an axis making an angle of 45°, or indeed any angle with these axes.

To take a specific case—a personal one, for instance—I have quite recently fitted a set of floats to my steam model. In this model the distribution of weight may be considered as approximating to that of a full-sized machine. As an experiment three floats were fitted, a small one in front and two in the rear. The two latter were each 6 ins. broad by 2 ft. in length and the depth tapered towards the rear. Under ordinary circumstances the machine floated quite well on the water. Driven straight backwards by a gust there was a dipping down of the rear—but the model did not turn turtle. Suppose, however, it was facing say north and a gust struck it from the north-west—the left side was at once tilted up—the right float depressed downwards and backwards and the machine turned over sideways and backwards.

The lesson to be learnt from this obviously is that the floats if in apteroid aspect must have not only ample flotation in themselves, but must have it in the rear part of the float as well as in the front.

This, of course, only occurred when the machine was drifting on the surface of the water. If a machine is well surfaced it can rise from the water if the flotation be less than twice that of the machine, but such can easily be upset by a wind gust which tips it into such a position that one of the floats receives a considerably increased load.

So far as models are concerned the best average results so far have been obtained by the use of three floats ; a small one in the front and two larger ones at the rear, or two small ones in the front and one large one at the rear. Some good flights have also been made by models having two fair-sized ones in front and two somewhat larger ones behind.

It must not be forgotten, however, that all these models with, I believe, one exception, are of the loaded elevator type.

What would be quite likely to be of real value are experiments with tractor single-propeller type models, similar to the full-sized monoplanes so much in vogue. Preferably such should be power driven, but geared rubber motors could be used in order to keep the weight as far forward as possible. Long flights are not necessary, some 15 secs. being quite sufficient for initial experiments, careful attention being paid as to how such models rose from and alighted on the surface of the water.

The model should preferably weigh not under a pound and a-half to two pounds, the reason for this being that I found when towing my steam model through the water, that certain water phenomena, to which I intend making reference later on, were quite pronounced ; phenomena which if not altogether quite non-existence in 6 to 12-oz. models, are so insignificant as to escape any but the closest observation. Anything in the nature of an attempted free flight with the above-mentioned model is *pro tem.* impossible, owing to a broken connecting-rod. Experiments to be of use to designers of full-sized machines must, however, be made on models of a similar type and at least of fair size. So long as so much stress is laid in competitions on mere distance and duration, such competitions will, I am afraid do, practically speaking, nothing to forward the *science* of aviation.

Reply in Brief.

A. C. BARLOW.—You do not say which way the propeller revolves, but it looks as if your trouble was due to the torque of the rubber motor. Nor do you state the pitch of the propeller ; if coarse, try a finer pitch or one of lesser diameter, and note result, or a geared motor, as previously recommended. You should also note carefully if fin is set correctly, and especially if either wing is warped. You might also vary the number of rubber strands ; the length of your motor is decidedly short. Note, also, if machine is balanced about its longitudinal axis. So many things may cause the trouble you refer to. As a last resort, increase the area of the fin, although this should be sufficient.

CORRESPONDENCE.

*** The name and address of the writer (not necessarily for publication) MUST in all cases accompany letters intended for insertion, or containing queries.*

Correspondents communicating with regard to letters which have appeared in FLIGHT, would much facilitate ready reference by quoting the number of each letter.

Military Trials and the "Avro."

[1619] In view of your technical editor's article in this week's FLIGHT, which clearly establishes that the "Avro" was slightly underpowered for the Military Trials, I should, in fairness to the engine makers, like to state that owing to the exigencies of propeller design the engine was run at over 100 revs. below its proper speed for full power.

Eastchurch. WILFRED PARKE, Lieut. R.N.

The X Constant.

[1620] Mr. Berriman's theoretical deductions from the results of the Military Trials have interested me greatly, but there are one or two points which are not quite clear to me.

The first is, that—although I quite understand how the factor X is obtained, and realize its importance and usefulness—I am at a loss as to the theoretical considerations involved in the appearance in the factor of the *square* of the weight. Would not $\frac{W}{HP \times A}$ be apparently more reasonable, seeing that, as it stands, a comparatively small change in weight may result in a considerable difference in the efficiency claimed?

My other difficulty concerns the deduction of the power from the gliding angle. Surely the thrust found is that which obtains only at the gliding speed, and should be multiplied by $\left(\frac{\text{maximum speed}}{\text{gliding speed}}\right)^2$ before calculating the power at the maximum velocity! Also, in my opinion, the result so obtained will not be a measure of the machine's efficiency, but rather of the actual power exerted at the time; for will not all tendencies to inefficiency affect the gliding angle?

Slough. L. A. GAFFNEY.

[The purpose of the constant X is to provide information *in advance* before anything is known of the actual performances of the machine; its merit, such as it has, is mainly derived from this aspect of its utility. Through its application, the designer is able to check the reasonableness of his intentions with regard to weight, power, and wing surface.

It is necessary to assume a gliding angle that the machine can be designed to attain; but, to-day, this should scarcely be more a matter of doubt than that the machine can be built to its specified weight.

It is true that the resistance at the maximum flight speed is greater than the gliding resistance, as has been pointed out in the articles already, but although this affects the real numerical value of the efficiency actually obtained, it does not destroy the utility of using the gliding resistance multiplied by the maximum flight speed as a uniform basis for the efficiency calculation of every machine.—TECH. ED.]

The Breguets and the Army Trials.

[1621] It must have appeared strange to many of your readers who are not aware of the exact circumstances that two machines of such acknowledged reputation as the Breguet, having been entered for the Military Trials, should have failed to go through their tests—particularly in view of the success attained by them in the French military trials last year—and we should be glad if you would allow us this opportunity of making an explanation.

At the time of the promotion of the English Breguet Co., one of the foremost plans was to enter two machines entirely constructed in England for the trials which have just taken place. Inevitable delay occurred in the formation of the company, the selection and equipment of a suitable factory, and it was found impossible to start work on the machines until July 5th, that is to say little more than three weeks before the last day for delivery at Lark Hill. It was then decided to enter a French machine in place of one of the British ones, and leave to do this was obtained. Mr. Rhodes Moorhouse, who was to bring this machine across, was delayed by weather until almost the end of July, and when he crossed the conditions were so bad on this side that he had to descend quickly on to an unsuitable landing ground with the result that the machine was put out of action as regards the trials, although a record had been established in the carrying of three passengers across the Channel.

Difficulty in obtaining the necessary material over here in the short time remaining delayed the completion of the British machine, and it had to be sent off at the last moment, absolutely untuned and untested. The machine arrived at Lark Hill not without further delay and mishaps in the shape of a broken axle to the contactor's lorry, &c. After a period of tuning and general adjustment it was found that the propellers were apparently too large for the engine for the reason subsequently explained. New propellers were obtained and the machine began to show to proper form. It then became evident that the cause of the trouble was that the bevel transmission gear was so new that it had not begun to run sweetly. From that time every hour of running considerably added to the number of revolutions. A few days before the competition closed, Moineau, the pilot, was quite satisfied with the machine, and would have gone through the tests at once had it not been for another untoward occurrence, viz., the working loose and destruction of the pinion of the magneto shaft. We at once sent to Paris for another, but by the time it had arrived and was fitted the competition was declared closed.

It has been a great disappointment to us to have been prevented by these successive misfortunes from going through the tests, we shall hope, however, shortly to have an opportunity of demonstrating the capabilities of the machine entered by us, elsewhere.

1, Albemarle Street, W. BREGUET AEROPLANES, LTD.

Military Trials.

[1622] After reading your excellent number of September 7th, it occurs to me to suggest that your technical editor should publish a comparison between the original Wright machine, as flown in the south of France before King Edward VII and Mr. Cody's machine of to-day. The result would, I venture to think, give us a useful measure of recent progress.

Incidentally to help in estimating Mr. Cody's world-position, one would like an assurance that M. Prevost and the French Dep. are equal to the best French combinations flying to-day, or otherwise.

As you remark, Mr. Cody's machine is easily adaptable for a suitable armament. A bomb tube might well be placed behind the pilot to be worked by the man sitting in the tandem seat. This tube should be telescoping, so that when extended it would guide the bombs clear of the machine in the air, and when shortened clear the ground for landing.

A machine gun might be placed on either side worked by the men in the side seats—one, perhaps, of the Rexer type, sliding in guides so that it could be run up to clear the top plane when firing upwards.

This arrangement might not be found the best in practice, but it could easily be modified, and there seems no other flying machine in the world which gives such good all-round view and facilities for offensive work. All four men would be available for observing too.

If this machine were re-designed so as to provide the extra power necessary, and incidentally to climb faster, one could hardly wish for a more formidable weapon with which to attack the score or so of dirigibles which may be expected on our coasts if war should break out to-morrow.

R.A. (Retired).

Automatic *versus* Inherent Stability.

[1623] I have to thank Mr. Harrison for his letter (No. 1615) pointing out "a couple of flaws" in my method of obtaining inherent stability, but I am afraid I am as yet unconvinced. In fact, it seems to me that Mr. Harrison has utterly failed to grasp the principle of the thing at all. I will try to make myself clearer. In the case of an aeroplane making a turn, the outer wing travels faster than the inner, hence the pressure on the former is greater than that on the latter. If now the wings are hinged about their leading edges, and are interconnected as to their trailing edges, the outer wing will decrease its angle of incidence, owing to the greater pressure on it, and the inner wing will therefore be compelled to increase its angle of incidence; and these movements will continue until the pressures on the wings are exactly equal and there is no upsetting couple laterally. In other words, the machine would make a turn without banking, and in order to effect a bank it would be necessary to interrupt with hand control.

As to the movements of the centres of pressure complicating the longitudinal balance, I would point out that, as the centre of pressure on the leading plane moves forward it is counteracted by the centre of pressure moving backward on the aft-plane, and *vice versa*.

Lincoln's Inn Fields. JOHN V. L. HALL.

[1624] I am afraid that Mr. Hugh G. Harrison (1615) is in error in his remarks *re* Mr. Hall's suggestion. He must consider the conditions that tend to cant the aeroplane. If the pressure on one wing is suddenly increased, then its angle of incidence decreases, while at the same time the angle of the other wing increases. If

Mr. Hamilton will draw a diagram representing the conditions, he will at once see that forces are in action tending to restore the machine to the horizontal (assuming the machine to have already canted). His second objection is of some moment, but he must remember that in gusty weather, although the attitude of the machine may not change, yet the directions of the wind currents does, and would thus vary the position of the centre of pressure. This is corrected by the pilot. Possibly the flexibility of the wings would even result in a fairly constant position of the centre of pressure, the reverse of Mr. Harrison's suggestion.

Coventry. F. W. LUDLAM.

[1625] Mr. F. W. B. Hambling (letter 1614) is undoubtedly very near the mark in suggesting a combination of automatic and inherent stability. But while the automatic has yet to be proven, the most inherently stable machine has been flying at least three years, namely, the Dunne. Yet for all the advance this machine has made in regard to stability, no other constructor has attempted to take it up. Why is it? Is it because the craze for weight-lifting has not yet subdued? For there appear to be several "in the game" ever ready to uphold efficiency against stability. There is one machine, at least, in the Military Trials loaded to 8 or 9 lbs. per sq. ft., but no attempt has been made to further its stability beyond careful designing; it is just the same old T shape that has killed too many of our best men, and will go on killing so long as the T system is used.

Folkestone. R. T. SAUNDERS (*Dunnem*).

[It is to be hoped that our correspondents who are conducting among themselves this correspondence on automatic *versus* inherent stability are in thorough accord as to what they mean by "stability" in air. One of the above letters criticises the heavy loading of a machine in the Military Trials, presumably in reference to the Bristol. The criticism is unjust and evidently based on a lack of appreciation of facts, which leads us to make the above remark in our opening sentence. Thus the Bristol monoplane was successfully flown by Pixton in a wind varying from 17 to 44 miles an hour. We published the wind chart on August 31st and no one who sees it should lack appreciation of the performance. While flying, the wings of the machine warped automatically to such an extent that the pilot could hardly hold the control lever. In the hands of the pilot in question, however, the machine was certainly safe enough for anyone, consequently the question arises does a critic of it imply by a "stable machine" one that can be taken up by any fool in such a wind, and come down again harmlessly?

That there is a great deal in wing form, about which we at present know very little, is admitted on all sides; but it is from the practical flying of machines like the Dunne and the Handley Page that we must seek the data for the construction of our future theories. In the recent account of the Military Trials we had occasion to refer to this very subject and to remember with appreciation also the early work of Weiss, which was essentially directed along these lines. Weiss's models could be dropped sideways, vertically, and would right themselves. Gordon England glided in the Weiss man-lifters without controls, and never came to grief. But still, the fact remains that it is not by talking, but by actual and frequent demonstration in flight, that the principle of the crescent wing and the Dunne modification thereof will have to prove themselves worthy of setting the line of future development. That there is a great deal in the principle of the crescent wing is more than likely. No one can look at the general form of a bird and not observe that the retreated wing-tip is a peculiarity common to most if not all species; the feature may be incidental to anatomical construction, but equally well may it also be a consideration of importance on aerodynamic grounds. We have heard many theories about the crescent wing, but we have yet to find one that is quite as simple and as plausible as we should like. Also, we have yet to learn what price it asks us to pay for this wonderful "stability": it may be that the bird will have to teach us also how to use it with effect.

In the meantime, aeroplane constructors continue to build machines that they know will give satisfaction within the limits of commercial requirements. It is for the pioneer to set the pace in some new direction, and while we say in all sincerity, may good luck go with him, nevertheless we see no reason for condemning the modern aeroplane, or for feeling other than a profound admiration and respect for the men who have made the flying of it what it is to-day.—ED.].

Flexible Wings and Stability.

[1626] In answer to Mr. J. V. Hall's letter (1607), a model using the principle he suggests, designed by one, Mr. Goodchild, was illustrated in FLIGHT of April 2nd, 1910. Also, a full size machine, the Chauvière, was built with interconnected flexible wings I believe, but what came of it I do not know. Probably, in very gusty weather, more harm would come from the device than good, owing to the movements of the planes being too rapid and severe, thus disturbing the stream-lines and giving rise to eddies.

Coventry. F. W. LUDLAM.

Long Tests with "Adjudant Reau."

LEAVING Issy at 8.45 on the morning of the 4th inst., the dirigible "Adjudant Reau" was steered over Paris, Enghein, and Pontoise, during which experiments were made with wireless telegraphy, and the airship returned to Issy at five minutes past eleven. She carried fourteen officers.

Tests with the Schutte Lanz.

DURING an attempt to sail from Johannisthal back to its headquarters at Frankfort, the rigid dirigible "Schutte Lanz" was obliged to put back into Gotha owing to motor troubles on the 4th inst. The voyage was resumed later in the day, but owing to the trouble recurring a return was made to Gotha.

Work with the Russian Dirigibles.

THE Russian military airship "Iastred," piloted by Capt. Chapsky, got up to 1,800 metres on Saturday, a height record for Russia. The dirigible "Griff," with fourteen passengers on board, was cruising over Berditcheff for the observation of the manœuvres.

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AEROPLANES, airships, balloons and parts thereof (not shown separately before 1910):—

	Imports.		Exports.		Re-Exportation.	
	1911.	1912.	1911.	1912.	1911.	1912.
	£	£	£	£	£	£
January ...	1,196	619	1,088	2,412	Nil	Nil
February	3,129	3,110	1,786	36	Nil	Nil
March ...	11,327	640	1,027	950	357	600
April ...	2,110	4,820	807	72	4,343	50
May ...	1,707	7,494	2,471	1,350	1,972	154
June ...	3,225	7,928	2,432	419	1,682	300
July ...	9,822	13,794	2,256	5,376	643	967
August ...	2,873	8,559	2,153	1,342	265	2,040
8 months	35,389	46,964	14,020	11,957	9,262	4,111

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Aeronautical Patents Published.

Applied for in 1911.

Published September 12th, 1912.

11,784. A. LIWENTHAL. Aeroplanes.
11,785. A. LIWENTHAL. Aerial propellers.
11,786. A. LIWENTHAL. I.C. engines.
12,188. I. BELL. Machines for aerial flight.
18,923. G. W. EVANS-CROSS. Aeroplanes and model flying machines.
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25,468. VICKERS, LTD., AND A. R. LOW. Aeroplanes.
25,617. R. G. OLIVER. Aeroplanes.

Applied for in 1912.

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8,069. J. SCHUTTE. Dirigible balloons.

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